SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter. Copyrighted, 1889, by Munn & Co.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LXI.—No. 13. ESTABLISHED 1845.

NEW YORK, SEPTEMBER 28, 1889.

$3.00 A YEAR. WEEKLY.

UTILIZING WAVE POWER AT THE SEA BEACH.

Ocean Grove is a popular summer watering place on the New Jersey coast, nearly fifty miles south of New York City, and here, during the past season, the plant represented in the accompanying illustration has been put in place, and seems to have performed the work for which it was designed in a very satisfactory manner. The pier has several gates, of which only one is shown in our illustration, each of the gates being swung upon a steel rod, so that the lower part of the gate will be submerged at all tides—two feet submergence at low tide and seven feet at high tide representing the average calculated upon. At the top of the gate is secured one end of an arm, whose other end is pivotally attached to a jointed connecting rod, which extends beneath the platform of the pier to the piston rod of a pump, as shown in Fig. 1. Each gate is 13 feet long, and the waves, as they strike the gate, swing it inward, the force of each wave sufficing to effect a stroke of the piston, whereby water is lifted from a sunken well beneath the tower to a tank 40 feet high.

It is easy to see that, with the connections so made as to utilize the power obtained a little farther from the water's edge, or by carrying the well far enough down, it would be possible to supply the tank with fresh water, but this has not been sought in the present instance. The water here has been principally used for sprinkling the streets, and it is stated that in one day 40,000 gallons were thus supplied for this purpose. Opinions are somewhat divided as to the advisability of generally using sea water for street sprinkling, but nothing can be said against its employment for flushing sewers, extinguishing fires, etc., and the construction herewith represented offers what appears to be a practical means to facilitate such use.

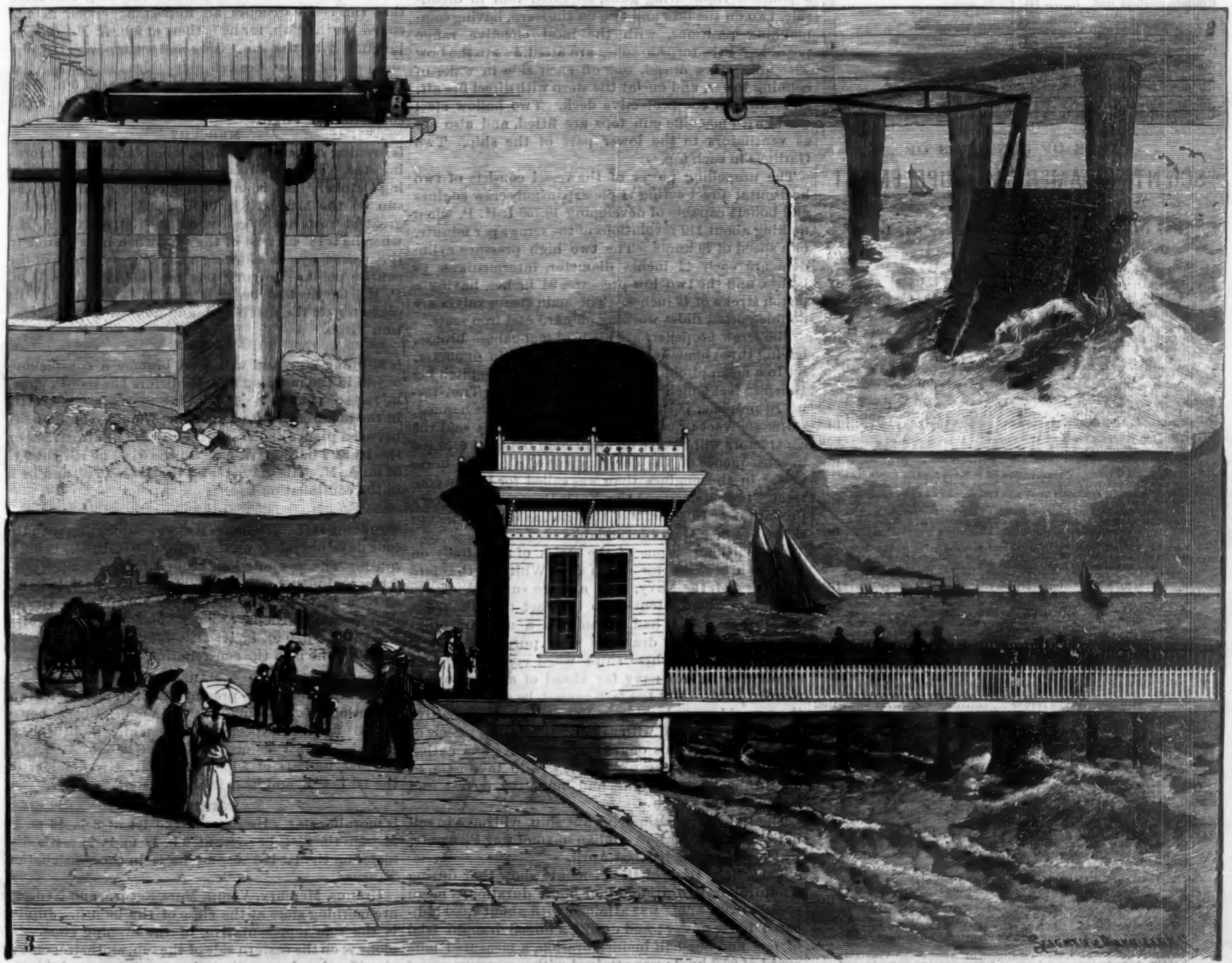
The Insulted Chinese.

The Rev. Charles H. Fowler, D.D., of San Francisco, a bishop of the Methodist Episcopal Church, who has just completed a trip around the globe, expresses the belief that ten years hence America will pay for its anti-Chinese laws with the blood of her citizens. He occupied the entire session of the Methodist ministers at Chicago recently in speaking about his observations of missionary work abroad, the object of his trip being to personally inspect the workings of foreign missions.

In speaking of the law prohibiting the Chinese from coming to America, Bishop Fowler said it was the most dastardly and disgusting thing that America ever did, "and," he said, with a slow emphasis which was very impressive, "it will be paid for some day by the blood of some of America's best men." He thought every American should blush for shame when he thought of the violation of the treaty with China, whereby Chinamen were refused permission to land on our shores. "China is not asleep," he said. "They talk little, but they think. In some of the interior towns I met Chinamen who would surprise you by their knowledge. 'You lowed landee in China?' they ask. 'Yes,' I replied. 'Chinamen no lowed landee in Melica,' they reply; 'why you lowed come here?' One man said to me one day: 'Me no Clistian or me sendee you way.' I tell you they are thinking, and trouble is brewing. The greatest prince in China said to me one day: 'We are looking after our home interests now. Ten years will put China in shape as to her interior arrangements; then we will look after her outside interests.' They are making great guns and ironclads, and are manning them. In ten years a country with one-third of the inhabitants of the globe will be ready to ask what we meant by trifling with her treaty."

A NEW cement, for securing iron into stone, is described in some of the foreign papers. The cement is made by melting resin and stirring in brick dust, which must be finely ground and sifted, until a sort of putty is formed, which, however, runs easily while hot. In using, the iron is set into the hole in the stone prepared to receive it, and the melted putty poured in, until the space is filled; then, if desired, bits of brick, previously warmed, may be pushed into the mass, and a little of the cement thereby saved. As soon as the whole is cool the iron will be firmly held to the stone, and the cement is quite durable and uninjured by the weather, while, unlike lead and sulphur, it has no injurious effect on the iron.

NINETY-NINE per cent of ambition to try, and one per cent of talent, is all that is necessary to success in whatever we undertake.



1. Pump and sunken well. 2. Gate operating pump piston. 3. Water tower.

WAVE POWER EMPLOYED TO PUMP WATER FOR SPRINKLING PURPOSES AT OCEAN GROVE, N. J.

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year, for the U. S. or Canada.......................$3 00
One copy, six months, for the U. S. or Canada.......................1 50
One copy, one year, to any foreign country belonging to Postal Union, 4 00
Remit by postal or express money order.

Australia and New Zealand.—Those who desire to receive the SCIENTIFIC AMERICAN, for a little over one year, may remit £1 in current Colonial bank notes. Address

MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, for U. S. and Canada. $6.00 a year to foreign countries belonging to the Postal Union. Single copies, 10 cents. Sold by all newsdealers throughout the country.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, to any address in U. S. or Canada, on receipt of seven dollars.

The safest way to remit is by draft, postal order, express money order, or registered letter.

Australia and New Zealand.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for a little over one year on receipt of £2 current Colonial bank notes.

Address MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

NEW YORK, SATURDAY, SEPTEMBER 28, 1889.

Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT

No. 717.

For the Week Ending September 28, 1889.

Price 10 cents. For sale by all newsdealers.

SUCCESSFUL TRIALS OF THE NEW CRUISER BALTIMORE.

The four days' government trials of the Baltimore were completed Sept. 15, when she returned to Philadelphia from her run off the Delaware coast. She came up the Delaware river with a broom fastened to the foremast and another to the mainmast—public evidence of the success obtained by the builders of the vessel. Her commander, Captain Schley, said that the trip had been entirely successful, and that the engines were all right and had worked admirably. The vessel went eighty or ninety miles out, and is a beautiful sailer. "You can be perfectly confident in saying that she is the fastest man-of-war afloat," said he.

All data and indicator cards were taken every fifteen minutes from both ends of every cylinder on the ship, which made for three hours an average of about twenty and two-tenths knots an hour in a moderately rough sea. Many of the people on board thought she was making better time; but, allowing for all errors in calculation, log lines, etc., she is believed to have made twenty and two-tenths knots. The trial indicates, it is said, that she is the fastest vessel of her tonnage afloat, and the fastest man-of-war of any country. The Baltimore ran straight ahead all the time. There was nothing from the time she left the dock until her return that occasioned any stopping. It is also stated that the Baltimore will probably show more than 10,000 horse power; 9,000 horse power was the amount contracted for.

She was built by Messrs. Cramp & Sons, of Philadelphia. The principal dimensions are:

Length over all	335 feet.	
Length between perpendiculars	315 "	
Breadth, moulded, amidships	48 "	6 inches.
Mean draught of water	19 "	6 "
Displacement to mean draught	4,400 tons.	

The armament consists of four 8 inch breech-loading rifled guns mounted in barbette, two on the forecastle and two on the poop, each having a train on their respective sides from a line parallel with the keel to 60° abaft and forward of the beam respectively. The remaining battery is composed of six 6 inch breech-loading rifled guns, three in a broadside, mounted on platforms having semicircular galleries projecting from the vessel's sides. The secondary battery consists of eight 6 pounder rapid-firing guns, mounted four in broadside, two on the bow and two on the stern, having commanding positions, with the most effective range possible. Five torpedo tubes are fitted, two in the bow with direct fire ahead, one on each side in wake of conning tower, and one at the stern with direct fire aft, all located on the protective deck. Two hollow steel masts with machine gun tops are fitted, and also act as ventilators to the lower part of the ship. Two Gatlings in each top.

The propelling power of the vessel consists of two horizontal direct-acting triple-expansion screw engines and boilers capable of developing 10,750 I. H. P. when making about 110 revolutions of the screws per minute, or a speed of 20 knots. The two high pressure cylinders are each 42 inches diameter, intermediates 60 inches, and the two low pressures 94 inches, having a piston stroke of 42 inches. The main steam valves are double-ported slides working on hard cast iron seats.

The screw propellers are made of manganese bronze, having three blades each, 14 feet 6 inches in diameter, set to a mean pitch of 20 feet, with a variable pitch between 18 feet 6 inches and 21 feet 6 inches. The starboard propeller is right-handed, port one left-handed.

Her contract price was $1,325,000, and it is said the contractors will receive an additional bonus of $135,000 in consequence of the development of a greater horse power in the engines than was called for by the contract. It is understood the Navy Department is very jubilant over the results of the trial, as the ship is considered to be fast and formidable.

The Baltimore is one of the series of ships built on English drawings, for which Mr. Whitney, the late Secretary of the Navy, paid a large sum. We have heretofore called attention to the fact that the plans for all these vessels had become, in a measure, obsolete at the time the drawings were purchased. It is true every one of these ships when completed forms an addition to our navy far ahead of any of our old wooden boats. But the fact cannot be disguised that the new ships are lacking both in speed and defensive power as compared with some of the latest vessels of other nations. This ought not to be. A great nation like ours, in building new ships, should take care to obtain the latest designs, and build the fastest and most effective vessels.

The Baltimore, although a fine ship, will have to sail in the wake of the new Italian man-of-war Piemonte, which was completed last April.

The official trials of the Piemonte show that during a natural draught trial of four hours' duration, a mean speed of 20·4 knots was attained with about 7,000 indicated horse power; and during a forced draught trial of one and one-half hours' duration, a measured mile speed of 22·3 knots was attained with a mean power of 12,700 horses, the maximum power which was maintained for a considerable time exceeding 13,000 horse power. The displacement of this vessel is only 2,500 tons, yet she carries six 6 in. quick-firing guns, six 4¾ in. quick-firing guns, and a large number of smaller guns. She is protected by a strong armor deck with sloping sides, and she has attained great speed.

The armor deck of the Piemonte has sloping sides 3 inches thick, as in the Admiralty cruisers; upon these coal can be carried, and in this condition it is claimed the deck is proof against the attack of modern shell guns up to guns of 6 inches caliber.

Speaking of her armament on a recent occasion, Lord Armstrong said: "She will be capable of discharging against an adversary, in a given time, twice the weight of shot and shell that could be fired by the largest war vessel now afloat, not excluding the leviathan battle ships of five or six times her size, which could ill withstand the torrent of shell which the Piemonte could pour into the large unarmored portions of their structure."

The machinery of the Piemonte is wholly below the water line.

Special arrangements have been made for securing good turning power in the ship, a large balance rudder is provided, and much of the after deadwood is removed, and at the trials made it was shown that the ship could maneuver exceedingly well, completing a circle of 508 yards in 3 minutes 24 seconds.

POSITION OF THE PLANETS FOR OCTOBER.

VENUS

is morning star. She stands first on the October record, not only from her charming appearance in the morning dawn as the sun's bright harbinger, but also from her close conjunction with Mars on the 1st, at 8 h. 2 m. A. M., when she is 22′ south of him. The planets rise on the 1st about 3 h. A. M., nearly three hours before the sun, and will be seen near each other, though the conjunction takes place in daylight. They must be looked for in the northeast soon after they are above the horizon. Venus will need no guide to point out her position, but an opera glass will probably be required to bring Mars into the field. Venus rises on the 1st at 3 h. 10 m. A. M. On the 31st she rises at 4 h. 16 m. A. M. Her diameter on the 1st is 13″, and she is in the constellation Leo.

URANUS

is evening star until the 15th, and morning star after that time. He reaches an important epoch in his course on the 15th, for he is then, at 9 h. A. M., in conjunction with the sun, rising and setting with the sun and passing to his western side. Uranus sets on the 1st at 6 h. 7 m. P. M. On the 31st he rises at 5 h. 10 m. A. M. His diameter on the 1st is 3″.4, and he is in the constellation Virgo.

MERCURY

is evening star until the 15th, when he becomes morning star. Two important epochs mark his course during October. He is in inferior conjunction with the sun on the 15th, at 8 h. 10 m. P. M. He reaches his greatest western elongation on the 31st, at 11 h. A. M., when he is 18° 42′ west of the sun, when he is visible to the naked eye as morning star, being 8° north of the sunrise point. Mercury sets on the 1st at 6 h. 11 m. P. M. On the 31st he rises at 4 h. 55 m. A. M. His diameter on the first is 8″.4, and he is in the constellation Virgo.

SATURN

is morning star, and will soon become a conspicuous object in the morning sky, for before the month closes he rises about one o'clock in the morning. He is still in the neighborhood of Regulus, though the distance between planet and star is increasing. Saturn rises on the 1st at 2 h. 33 m. A. M. On the 31st, he rises at 0 h. 50 m. A. M. His diameter on the 1st is 15″.6, and he is in the constellation Leo.

JUPITER

is evening star. He makes a close conjunction with the four days' old moon on the 28th, at 6 h. P. M., being 7′ south. The conjunction occurs before sunset, but moon and planet will form a charming celestial picture as soon as it is dark enough for them to be visible. Jupiter sets on the 1st at 9 h. 48 m. P. M. On the 31st, he sets at 8 h. 9 m. P. M. His diameter on the 1st is 36″.0, and he is in the constellation Sagittarius.

MARS

is morning star. He presents no interesting feature excepting his conjunction with Venus, but a better record may be expected before many months have passed. Mars rises on the 1st at 3 h. 5 m. A. M. On the 31st, he rises at 2 h. 40 m. A. M. His diameter on the 1st is 4″.2, and he is in the constellation Leo.

NEPTUNE

is morning star. He rises on the 1st at 8 h. 13 m. P. M. On the 31st, he rises at 6 h. 12 m. P. M. His diameter on the 1st is 2″.5, and he is in the constellation Taurus.

Uranus, Mercury, Venus, Mars, Saturn, and Neptune are morning stars at the close of the month. Jupiter is the sole representative of the evening stars. He alone is on the eastern side of the sun, and astronomical classification decrees that planets when east of the sun shall be called evening stars; and when west of the sun, morning stars.

[SPECIAL CORRESPONDENCE OF THE SCIENTIFIC AMERICAN.]

The Paris Exhibition.

THE MACHINE TOOL EXHIBITS.

PARIS, Sept. 15, 1889.

I stated in my letter giving an account of an inspection of the railway works (of the Northern Railway of France) at Hellemmes that there was only one planing machine in the whole shop, and I then stated that it appeared to me that milling machines were more used upon large work in France than is the case in either America or England. This statement is now borne out by the fact that, notwithstanding the immense exhibits of machine tools in the Palais des Machins, I have only come across two planing machines (and one of these is American), while the milling machines may be counted by the score. If I am correctly informed, two of the largest milling machines exhibited are sold to go to the United States, both being designed to take the place of planing machines. There are, it is true, two planing machines in a large building outside the Palais des Machins, but in this exhibit there are a dozen milling machines. In this connection let me state that, notwithstanding the immense size of the Palais des Machins (it is over a quarter of a mile long), a very large quantity of machinery is crowded out of it. For example, the above-named exhibit fills quite a large building placed among the boiler buildings, where one would not think of looking for machines. The greater part of the locomotive and railroad car exhibit is in an annex outside of the Palais des Machins, while the agricultural machinery fills several large buildings at least a mile distant from the Palais des Machins. In other parts of the main buildings one comes unexpectedly across very large exhibits that ought to be in the Palais; indeed, the whole of the exhibits of the technical schools are separated from the Palais the full length of the main buildings. "There's altogether too much of it. One cannot grasp it," is a remark frequently made by Americans here, and I know of men who have come here at considerable expense and gone away tired out without seeing the whole of even those exhibits they were most interested in.

It is rumored that the exhibition may be kept open longer than was at first intended, because it is expected that the issue of tickets connected with the lotteries will be exhausted by the end of October, and it will then be possible to make an issue that will then sell for a franc instead of the half franc at which tickets can now be bought. Again, it is urged that so long as the exhibition is open money pours into Paris—a condition that will keep Paris satisfied, and therefore quiet, to the discomfiture of Boulanger; but, be this as it may, I have met many who have an idea that international complications are likely to follow the closing of the exhibition.

A few words may not be out of place here regarding the double price of admission exacted before ten in the morning and after six in the evening. The fact is that as far as the early mornings are concerned, but little if anything is gained, because but few of the exposed exhibits are visible, the attendants not getting the exhibits dusted and in order before ten. Many, indeed, do not attend before about eleven. In the Palais des Machins there is no power before twelve, and many attendants do not come until then; indeed, I find it almost useless to visit this part of the exhibition until about one, and the crowds are by that time so great as to seriously impede locomotion. At six o'clock in the evening an official is posted at every door, and nobody is allowed to pass from one building into another. Hence they pass out into the grounds. Those who intend to stay for the evening go to the restaurants to make out the time until admission is again permitted, and thus avoid the double price of admission. But the greater portion of the departments are closed in the evening, and even the Palais des Machins becomes to a great extent uninteresting, the chief attraction being the electric lights and colored fountains in the grounds. So far as the fountains are concerned, the display is not equal to those of the Colonial exhibition held in London in 1886. In the first place, the main fountain does not play so high, and the fountains being more spread out, the effect is not so charming. Again, there are no electric lights showing beneath the water as there were in London; and finally, there is no steam let in among the water for the colored lights to play upon. The display as a whole surpasses anything that has heretofore been attempted, because of the Eiffel tower, the statuary and the great size of the grounds.

The street in Cairo and its neighborhood is simply an immense fair, the noise, crowds, and bustle answering to what a crowded Sunday at Coney Island would be if the hotels were turned into caravansaries, where fans, toys, pipes, tobacco, and Eastern fruits and curiosities were sold. I have not, as yet, been through one-quarter of the outside buildings, nor been from end to end of the Decazeville railway, which by the way is doing quite a large amount of passenger traffic. The outside buildings along the banks of the Seine, excluding the exhibits of human habitations, are largely devoted to the agricultural exhibits. Beginning at the Jena bridge, there is first the petroleum exhibit, consisting of a tank containing 2,560,000 liters of raw petroleum, while in the rooms beneath it are drawings of the oil wells in various parts of the world, but more especially of Pennsylvania and Baku. Other exhibits are of oil-well drilling apparatus, with all the tools used. Models of tank steamers for petroleum. Pumping stations for pipe line. Photos. of petroleum refineries in America, France, Russia, and Austria. A Worthington pumping station. A geological chart of the oil regions in the United States. Various kinds of machinery used in oil pumping, and a carriage driven by a petroleum engine.

The next building contains exhibits relating to navigation and salvage, its contents being mainly confined to nautical instruments, models of ships, steam fire engines, tow rafts, life boats, and chemical fire extinguishers, while in an inclosure on the Seine beside this building are various crafts, including a gentleman's private yacht. The panorama of the various parts of the world to which the boats of the French transatlantic steamboats ply fills the next building, but as they make a charge for entrance, it is not so well patronized as the open buildings. French agricultural exhibits fill the next building, and among them there is one, on vegetable pathology, that attracts great attention. It consists of cases of leaves, small branches, etc., in which various diseases are shown in different stages of development. Next come some fine exhibits of long racemes of various fibers and different fertilizers, the effects of which upon the growth of a plant which I assume from the sketches to be Indian corn (of which there are some fine specimens of French growth in their agricultural departments).

These sketches are on a board immediately over some bottles containing the fertilizers. The first sketch shows a plant about a foot high grown in unfertilized soil or soil "without azote," as the sign has it; next is a plant about 16 inches higher and slightly more robust, beneath which is a bottle containing sheep manure. The successive increases in the sizes and robustness of the plant are in the following order: Dried night soil, disaggregated leather, cow manure, dried blood, torrefied horn, horn raspings, vegetable manure, nitrate of soda, and finally sulphate of soda, the plant fertilized with which is the tallest, being about four feet high and of robust growth. This reminds me that in the neighborhood of Reading, in England, the farmers use the refuse rags from a neighboring paper mill, and state that they find no manure so efficient and so lasting in its effects. Some of them used other first-class manures in the same field as these rags, and say that from the luxuriant growth of the plants they can tell the next year what part of the field the rags were used on. Another exhibit of prominence is that of horseshoes, which are of every size and shape, and many of which have never come into use. There is one, for example, in which short screws are inserted, the heads which are of half inch square iron, and about three-eighths inch deep project to afford the horse a foothold. Several varieties of band-fastened horseshoes are shown, while others are evidently designed to accommodate irregular or misshapen hoofs. There are in this building a great many skeletons of animals and of parts of animals, and paintings showing the appearance of various diseases of cattle and sheep. Among the exhibits of cereals there is shown wheat in the straw which is 8 feet high, the grain from its appearance weighing as much as 60 pounds to the bushel. It would be much more satisfactory if exhibits of this kind were accompanied with a statement of the conditions under which the grain was grown. I have seen, for example, samples of wheat in the straw, the ears of which were at least twice the length and breadth of ordinary ears, the grain weighing 60 pounds to the bushel, but in this case the soil was dug a foot deep with the spade, and only half the field was sown each year, that is to say, a breadth of five feet was sown and then a space of five feet was left bare, so as to recuperate ready for next year's crop while giving more root room for the growing crop and more free circulation of air. On the other hand, crops of sixty bushels per acre and sixty pounds to the bushel are not uncommon in Kent, England, where the soil is a light-colored clay, not more than six or at most seven inches deep, and rests on solid chalk.

Some of the samples of oats exhibited are five feet in the straw, the weight of the grain being about 46 lb. to 48 to the bushel (the imperial bushel of 277 cubic inches is here referred to). Among the various samples of root crops exhibited are some fine samples of beet roots and turnips; but the latter do not equal those grown in England, nor the former those grown in the United States, especially those of Kansas. There is a large case here containing models in wax of apples and pears, with the names of each variety affixed, the only classification being that of table apples and cider apples. Hence whether the table apples are culinary or dessert apples it is hard to say. In the next class we find exhibits relating to the grape culture and wine manufacture. First come examples of the various methods of grafting, both French and English; then young vines, with their roots sometimes not more than three-fourths inch in diameter, having roots seven feet long on them, the fibers running from one-fourth inch thick down to the thickness of sewing cotton. There is one vine stem four inches in diameter, which is considered very large here. Nothing approaching the California stems exhibited at Philadelphia in 1876 is to be found in Europe, except, perhaps, the celebrated vine at Hampton Court, in England.

Wine presses and cork-cutting machines form the most prominent remaining exhibits in this section.

The next section is mainly devoted to biscuit manufacture, the whole operation going on daily. At the end of this section there is a room about 16 feet deep and 20 or 25 feet wide devoted to the manufacture of chocolate, and here a very curious effect is produced, by means of which the room appears to be at least 70 feet deep. This is done by hanging from the ceiling canvas, on which a sham roof is painted, showing rafters, etc.; the end wall is painted to represent a continuance of these rafters, etc., and also a continuance of the side walls. The machinery also is painted on the back wall, with the operators all in their places, and so perfect is the deception that one has to get very close to discover it. On a raised flooring in this building, forming a sort of half landing, are large exhibits of confectionery, while the basement beneath is devoted to wine rooms, in which arches, pillars, and other decorations are composed of bottles in quite an artistic manner. In the Portugal exhibit an artificial vine runs around (on a lattice platform) a room about 40 feet square, the execution being exceedingly good.

In the next building are the agricultural exhibits of the Pays du Calais, in which we find grain in the straw and other agricultural products similar to those already described, including samples of tobacco and some clover very luxuriant and 2½ feet high. The succeeding exhibits are similar, save that they include hardware, leather, wool, pottery, wooden frame plows, and some geological exhibits in the way of limestones. In the matter of stoves, I may say that I have found American stoves in use in several parts of France, the "Crown Jewel" of the Detroit Stove Works being a case in point. The importer was Firmin Mignot, of Brussels. There are a great many stoves of American design in the exhibition having the shaking and dumping grates and most of the latest improvements. A great many of them, however, possess the advantage over stoves of American manufacture that the whole of the iron of the stove is enameled, some with a blue, some with a brown, and some with a black enamel; while on yet others the enamel has a colored pattern on it. This not only improves the appearance, but also saves much work in the way of stove cleaning. The cylinder stoves are very handsomely got up in enamel, and have handles on them to facilitate moving them about. This is, however, quite an unnecessary refinement.

JOSHUA ROSE.

Patent Office Annual Report.

The Hon. C. E. Mitchell, the Commissioner of Patents, has filed with the Secretary of the Interior the preliminary report of the operations of his bureau for the year ended June 30, 1889. There were received during the year 36,740 applications for patents, 808 applications for design patents, 101 applications for reissue patents, 1,281 applications for registration of trade marks, 772 applications for registration of labels, and 2,345 caveats; making a total of 42,047. The number of patents granted during the year, including reissues and designs, was 21,518; number of trade marks registered, 1,111; number of labels registered, 312; making a total of 22,941. The number of patents withheld for non-payment of final fees was 2,858; number of patents expired, 11,920.

Upon the subject of legislation the commissioner says: "Some of the provisions which should be altered are Section 4,885, relating to the date of patents; Section 4,887, relating to the duration of patents for inventions previously patented in a foreign country; and Section 4,936, relating to reimbursement of moneys paid by mistake into the treasury." Mr. Mitchell thinks the policy of the Patent Office in adjudicating upon questions arising in the granting of patents should conform more nearly to the decisions of the federal courts.

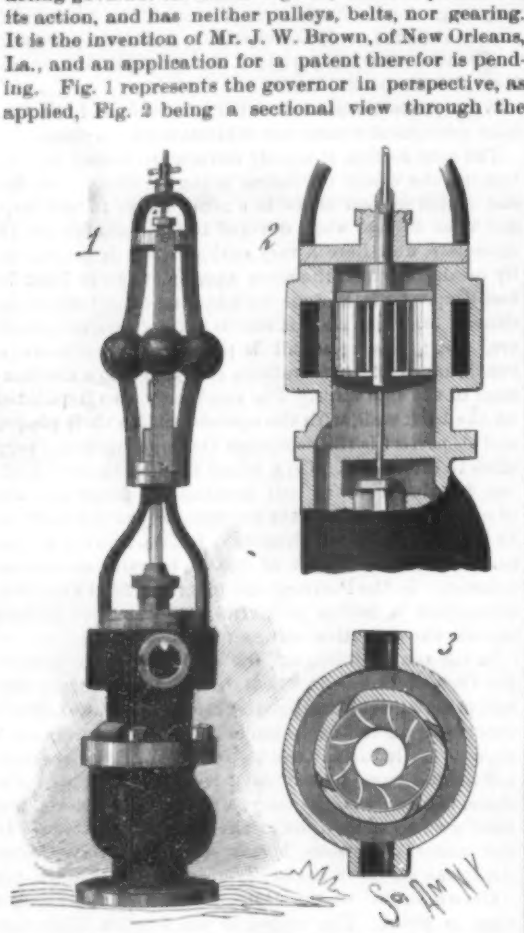
Tight Wooden Battery Boxes.

It has long been a subject of complaint with regard to wooden battery boxes, says *La Lumiere Electrique*, that, in spite of internal and external coats of varnish, they always begin to warp and leak after a certain time. With a view of remedying this defect the following process has been recently tried, it is said, with very satisfactory results: The boxes are dried and placed in a closed vessel, which is then exhausted. The protecting liquid is next allowed to run in, and when the boxes are well covered air is admitted, and the pressure of the atmosphere drives the varnish right into the pores of the wood, rendering it highly impermeable.

OF the twelve grand prizes granted at the Paris exhibition of 1889, four were awarded to citizens of the United States.

AN IMPROVED GOVERNOR FOR STEAM ENGINES.

The accompanying illustration represents a direct-acting governor for steam engines, which is positive in its action, and has neither pulleys, belts, nor gearing. It is the invention of Mr. J. W. Brown, of New Orleans, La., and an application for a patent therefor is pending. Fig. 1 represents the governor in perspective, as applied, Fig. 2 being a sectional view through the



BROWN'S STEAM ENGINE GOVERNOR.

steam inlet ports by which live steam is supplied to the engine on which the governor is placed, while Fig. 3 is a plan view of a turbine wheel placed in the path of the entering steam, the ports by which the steam is admitted to the engine cylinder being so arranged as to necessitate the passage of the steam through the turbine wheel. The shaft on which this wheel rotates extends upwardly and is hollow, and on this shaft are disks, by means of which the governor balls are supported, being connected therewith by thin straps of spring steel. The lower disk is rigidly connected with the shaft, and the upper one is free to move up and down thereon, so that the rapid rotation of the shaft tends to force the governor balls outward, in proportion to the speed attained, against the tension of the straps by which they are connected to the disks, and also against the pressure of a coil of spring wire surrounding the shaft and bearing against the upper disk. The amount of pressure to be exerted by this coil is adjusted according to the rate of speed it is deemed desirable to maintain. Secured to the top disk is a yoke, extending over the top of the shaft, and forming a bearing for a spindle which extends centrally down through the shaft to the live steam valve, as shown in Fig. 2. The top of this spindle is screw-threaded and fitted with lock nuts, by the adjustment of which the amount of steam to be admitted is regulated.

For further particulars with reference to this invention address the American Patent Operating Company, Limited, Thomas H. Underwood, President, No. 164 Common Street, New Orleans, La.

AN IMPROVED STORM APRON.

The accompanying illustration represents a form of carriage apron requiring less material in the process of manufacture than has heretofore been employed, and which can be quickly and easily applied to a dash. It has been patented by Dr. Peter J. Gibbons and Mr. David B. Shelly, of Pittston, Pa. The apron is made of rubber, oil cloth, or other waterproof fabric, and is cut at each side to form side flaps to go behind the dash, where their ends are united by a sprial spring or elastic webbing, as shown in Fig. 2, whereby the apron may be adjusted to a dash of any size. By means of leather straps on each side the apron is attached high up to one of the side sticks holding the curtain, and lower down it has an elastic strap on each side, with a hook, by means of which the apron is made fast at the side of the seat. The apron also has a central aperture covered by a flap for the passage of the lines, and thus applied, as shown in Fig. 1, presents an inclined plane, free from all pockets or ridges, which will not hold water at any point, and from which the water will rapidly pass off. This apron will not mark or wear the dash, and when not in use may be folded up to occupy but little room.

For further information relative to this invention address the Doctors' Carriage Storm Apron Co., Pittston, Pa.

GIBBONS AND SHELLY'S STORM APRON FOR CARRIAGES.

The Eiffel Tower Struck by Lightning.

A few days since the tall tower was, during a storm, hit by a thunderbolt, and many sensational stories have been circulated in reference to the occurrence. Some reports spoke of the lightning rod having been melted into a ball, others of a shower of molten iron dropping on the bystanders, and, again, others had wonderful tales of sheet lightning and electric shocks. In consequence the shares at the Bourse went down 60f. in one day, a result probably showing the "true inwardness" of the *canards*. At the last sitting of the Academy of Sciences, M. Mascart gave the true account of the incident, for accident there was none. The tower top is protected by three lightning rods, one vertical on the highest point and two oblique ones a little below, on the belvedere sides. Some time since, it seems, the end of the topmost rod was noticed to be slightly shaky, and as the piece weighs several kilogrammes, it was thought prudent to take it down for repairs, while the iron nut serving to hold it, screwed fast to the lower half, was left in place. It is this nut which was mistaken for a ball of melted iron. On examining it afterward it was found indeed that some particles had been struck off by the fluid, as when steel is struck with a flint, and to a like phenomenon the flying sparks may be attributed, but no appreciable portion of the metal was melted off. While the storm was at its highest, aigrettes of light kept issuing from the three rods, and the keepers were surrounded with a luminous haze. They were startled by the loud report when lightning struck the rod, but neither then nor at any time did they experience any shock. No harm befell any one on the tower at the time, and none can happen from thunderstorms, the conductibility being practically perfect.

Remarkable Career of an American Missionary.

The Department of State has received from the legation at Pekin, China, under date of July 3, an account of the death and extraordinary life-work of the Rev. J. Crossett, an independent American missionary in China. He died on the steamer El Dorado, *en route* from Shanghai to Tientsin, on June 21. He leaves a widow at Schuylersville, N. Y. In speaking of Mr. Crossett, Minister Denby couples his name with that of Father Damien, and says:

"Mr. Crossett's life was devoted to doing good to the poorest classes of Chinese. He had charge of a winter refuge for the poor at Pekin during several winters. He would go out in the streets on the coldest nights, pick up destitute beggars and convey them to the refuge, where he provided them with food. He also buried them at his own expense. He visited all the prisons, and often procured the privilege of removing the sick to his refuge. The officials had implicit confidence in him, and allowed him to visit at pleasure all the prisons and charitable institutions. He was known by the Chinese as the 'Christian Buddha.' He was attached to no organization of men. He was a missionary pure and simple, devoted rather to charity than proselytism. He literally took Christ as his exemplar. He traveled all over China and the East. He took no care for his expenses. Food and lodging were voluntarily furnished him, innkeepers would take no pay from him, and private persons were glad to entertain him. It must be said that his wants were few. He wore the Chinese dress, had no regular meals, drank only water, and lived on fruit with a little rice or millet. He aimed at translating his ideal Christ into reality. He wore long auburn hair, parted in the middle, so as to resemble the pictures of Christ. Charitable people furnished him money for his refuge, and he never seemed to want for funds. He slept on a board or on the floor. Even in his last hours, being a deck passenger on the El Dorado, he refused to be transferred to the cabin, but the kindly captain, some hours before his death, removed him to a berth."

AN IMPROVED COCOANUT PARER.

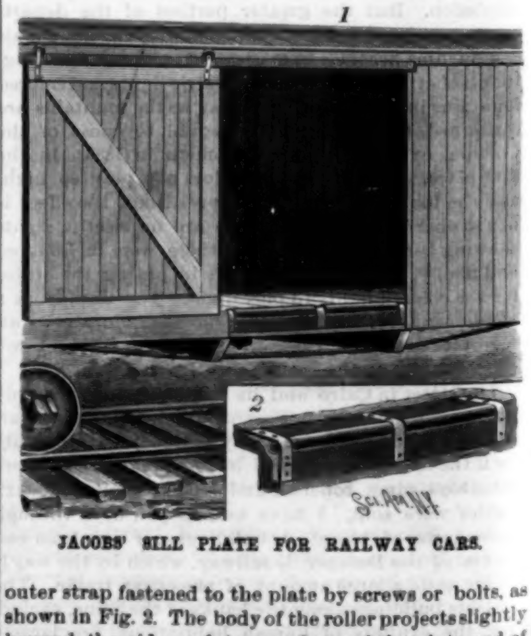
A machine for paring cocoanuts after the shell has been removed is shown in the accompanying illustration, and has been patented by Mr. Abram W. Lewis, of Asbury Park, N. J. The nut is clamped to revolve between holders journaled in standards secured to a suitable base, one rigidly and the other by dog and rack, permitting of a sliding movement on the base to engage cocoanuts of different sizes. A suitable train of gearing is arranged to revolve the nut and the circular plate carrying the paring device. The circular plate is secured to a sleeve on central post projecting from the base, and receives its rotary movement from a bevel gear mounted on the sleeve. On

LEWIS' COCOANUT PARER.

the post immediately above the sleeve carrying the circular plate is a collar carrying the horizontal arm which supports the knife post, and works over the face of the circular plate. The horizontal arm has a depending lug at its outer end which engages in turn with opposite marginal apertures in the circular plate. The post carrying the box in which the paring knife is held is jointed to the horizontal arm, and at the junction of the two is a coiled spring to force the post against the nut. A coiled spring is also placed on the central post, one end being secured thereto, and the other end to the horizontal arm. In operation, the lug in the horizontal arm being in the aperture on the right, the circular plate carries it in revolving and also the knife post; as the knife reaches the end of the paring on the left, the arm rides up on a beveled lug on the case, which forces the lug on arm out of the aperture, and the coiled spring on central post retracts the arm back to the first position at right, where the lug engages the aperture in advance.

AN IMPROVED SILL PLATE FOR RAILWAY CARS.

The accompanying illustration represents a doorway sill plate for railway cars provided with a roller along its upper front marginal portion, to ease the labor and quicken the work of sliding or passing freight in and out of the car, free from injury to the package. It has been patented by Mr. E. E. Jacobs, of Arcola, Ill. The plate proper has its floor and outside front portions cast or otherwise made in one piece, and is secured in a suitable way on and over the sills of the doorway. Its upper front marginal portion is formed with a recess to receive, with proper room for clearance, a roller made with journals, which rest and turn in suitable bearings, each of which is formed of a partial bushing and an

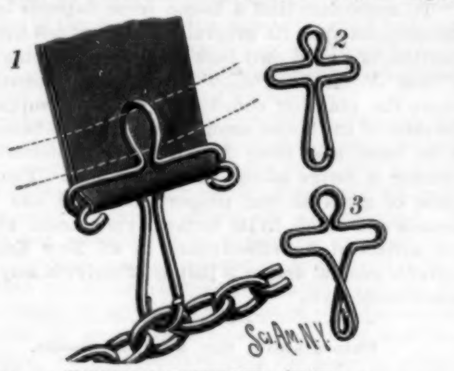


JACOBS' SILL PLATE FOR RAILWAY CARS.

outer strap fastened to the plate by screws or bolts, as shown in Fig. 2. The body of the roller projects slightly beyond the side and top surfaces of the plate and of the straps, making the roller the carrying surface for boxes or packages sliding in and out over it.

AN IMPROVED BACKBAND HOOK.

An improved device for securing the backbands of plow harness and similar gear, consisting of a simple form of hook, which may be easily applied, adjusted, and removed, is illustrated herewith, and has been patented by Mr. David D. Nolley, of Wilson, N. C. The hook is formed of stout wire of sufficient rigidity to resist the strains, and is approximately T-shaped,



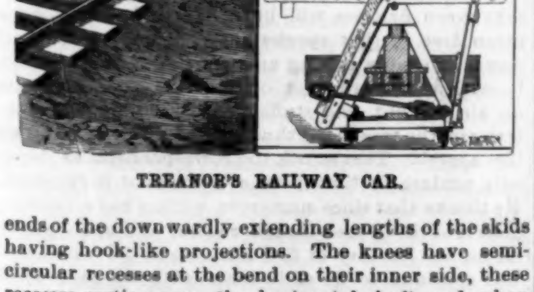
NOLLEY'S BACKBAND HOOK.

Fig. 1 showing it on the backband and Fig. 2 showing it detached therefrom. The reins may be passed through the ring or loop at the upper part of the frame, and the two hooks forming the lower end of the frame, by means of which engagement is made with the trace links, may either lie side by side, as shown in Fig. 2, or they may be crossed over upon each other, as shown in Fig. 3. In connection with the hook a stout wire keeper is employed. The ends of the backband are doubled over the keeper, and the ends of the latter are made to embrace the edges of the band, when the band is passed into the skeleton arms of the hook and drawn through till the keeper strikes their outer sides. The hook is thus securely held to the band, and may be readily adjusted or removed by simply drawing the keeper away from the frame.

For further information relative to this invention address Messrs. George D. Green & Co., Wilson, N. C.

A RAILWAY CAR FOR CARRYING WIDE STONES.

A car of special construction to adapt it for the transportation of stones of fifteen feet or more in width, and twenty-five feet or more in length, is illustrated herewith, and has been patented by Mr. James J. Treanor, of Hastings-upon-Hudson, N. Y. Upon the usual trucks are platforms connected by center and intermediate sills, the ordinary outer sills being cut away between the platforms. Above the center sills is mounted a heavy longitudinal girder, as shown in the sectional view, and upon the inner ends of the platforms are Λ-frames, braced by struts, these frames supporting a heavy horizontal shaft which passes through caps carried by intermediate Λ-frames resting upon the central longitudinal girder. At either side of the intermediate frames are arranged knees, between each pair of which skids are held, the lower



TREANOR'S RAILWAY CAR.

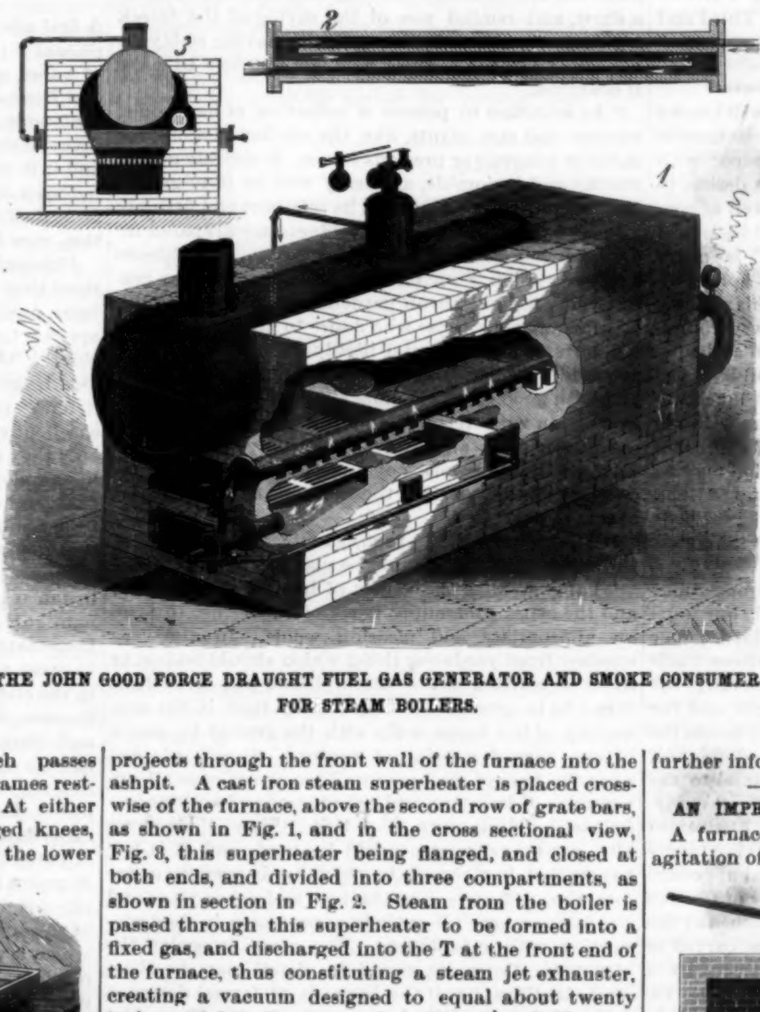
ends of the downwardly extending lengths of the skids having hook-like projections. The knees have semicircular recesses at the bend on their inner side, these recesses resting upon the horizontal shaft, and when the knees are in the position shown, their horizontal arms are engaged by vertical bars pivotally connected to the outer lower corners of the frames. Longitudinal tie rods are provided for the proper bracing of the car, and in loading the stone thereon the knees are moved to the position indicated by dotted lines in the sectional view, in which position they are blocked.

After the stone has been placed the block is removed and the knees lowered, the horizontal arms of the knees being then brought into engagement with the vertical bars pivotally connected to the frames, while a bar or rail is placed against the outer face of the stone, the ends of the bar being engaged by links provided with turnbuckles, the links being connected to projections near the base of the opposite side of the frames. With this construction the car will carry a very wide stone in such a way that neither edge of the stone will extend beyond the side edges of the car platform.

THE JOHN GOOD FORCE DRAUGHT FUEL GAS GENERATOR AND SMOKE CONSUMER FOR STEAM BOILERS.

The accompanying illustration represents a furnace construction whereby steam and air are superheated to form a fixed gas, and injected upward through the grates of the furnace by a steam jet exhauster, enabling coal screenings, etc., to be used, perfecting the combustion, and almost wholly doing away with smoke. This invention has been patented in the United States and Canada by Messrs. James E. Herring and John Good, of Napanee, Ontario, Canada.

A cast iron air pipe is placed lengthwise in the furnace, as shown in Fig. 1, to the outer end of which is attached a round pipe, through which air is drawn, as indicated by the arrow, this pipe being fitted with a vacuum gauge. At the opposite end of the pipe is a downwardly pointing elbow with a T, one end of which



THE JOHN GOOD FORCE DRAUGHT FUEL GAS GENERATOR AND SMOKE CONSUMER FOR STEAM BOILERS.

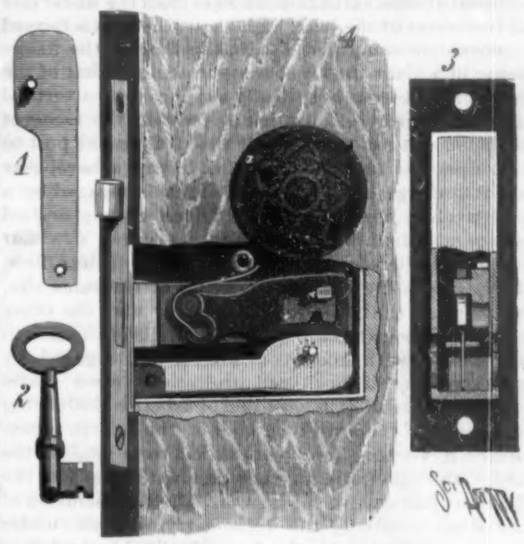
projects through the front wall of the furnace into the ashpit. A cast iron steam superheater is placed crosswise of the furnace, above the second row of grate bars, as shown in Fig. 1, and in the cross sectional view, Fig. 3, this superheater being flanged, and closed at both ends, and divided into three compartments, as shown in section in Fig. 2. Steam from the boiler is passed through this superheater to be formed into a fixed gas, and discharged into the T at the front end of the furnace, thus constituting a steam jet exhauster, creating a vacuum designed to equal about twenty inches weight of water, and sucking the air through the central pipe in the furnace with great force. This heated air and superheated steam are together forced upward through the grates, mixing with the fuel thereon and creating a powerful heat. In addition to the ordinary row of grates is a second row just beyond the bridge wall, the superheated steam and air striking the fuel on the first grate with such force as to carry a portion of the fuel back to the second grate, where the combustion is further maintained and the smoke consumed, a system of dampers being so arranged as to admit air and superheated steam to this part of the furnace. With a furnace thus constructed and operated, it is claimed that the solid fuel need be renewed only at long intervals, and that all smoke will necessarily be consumed.

For further information touching this invention address Mr. James E. Herring, Secretary Napanee Gas Company, Napanee, Ontario, Canada.

AN Italian engineer has experimented with sugar as a means of preventing the incrustation of boilers, with satisfactory results. A boiler which used to be incrusted in six weeks, had two kilogrammes of sugar introduced every week, for four months, and then a film of incrustations was found which could be easily washed off.

AN IMPROVED KEY-HOLE GUARD.

The accompanying cut illustrates an improvement in door locks. It consists of a small, thin metal plate, preferably steel, of the form shown in Fig. 1, com-



BENNETT'S KEY-HOLE GUARD.

bined with a lock and arranged within the lock case so as to extend between the keyholes, thus at all times effectually preventing any view through the keyhole. When the door is locked and the key is left in the door, there is no possible way of either pushing the key out, turning it in the lock, or tampering with it from the opposite side of the door; for, when the key is inserted from either side, the free end of the thin plate is pushed by the end of the key against the opposite wall of the case.

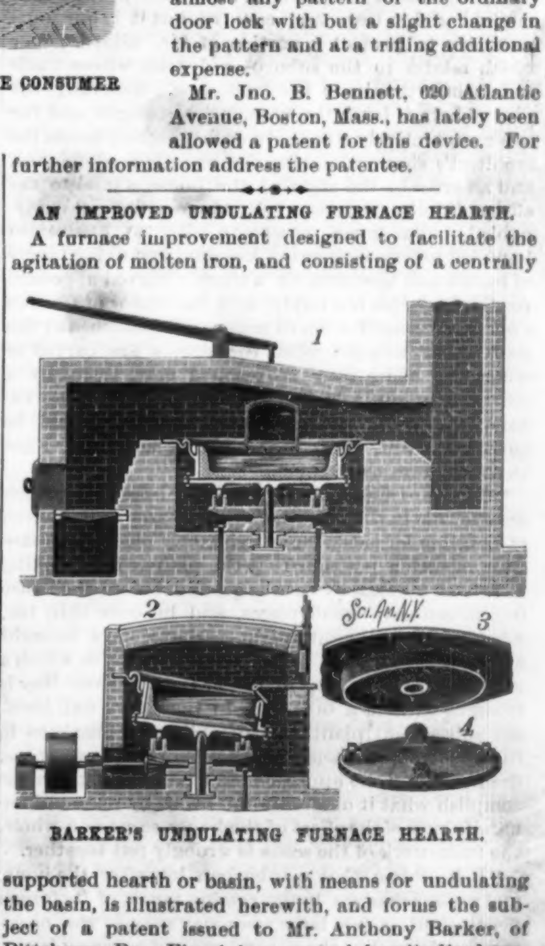
This effectually covers and closes the opposite keyhole, the thin plate standing then between the end of the key and the keyhole on the opposite side of the lock from which the key was inserted. This simple little device likewise prevents the key from turning in the lock and falling out by the natural jar of the door when closed.

Fig. 1 shows the form of plate preferably adopted by the inventor, Fig. 2 the key with hollow stem, Fig. 3 a cross section of lock, and Fig. 4 an interior side view of lock in which this improvement is embodied. This device is not applicable to locks already in use, but can be easily applied to almost any pattern of the ordinary door lock with but a slight change in the pattern and at a trifling additional expense.

Mr. Jno. B. Bennett, 620 Atlantic Avenue, Boston, Mass., has lately been allowed a patent for this device. For further information address the patentee.

AN IMPROVED UNDULATING FURNACE HEARTH.

A furnace improvement designed to facilitate the agitation of molten iron, and consisting of a centrally



BARKER'S UNDULATING FURNACE HEARTH.

supported hearth or basin, with means for undulating the basin, is illustrated herewith, and forms the subject of a patent issued to Mr. Anthony Barker, of Pittsburg, Pa. Fig. 1 is a central longitudinal sectional view of a reverberatory furnace having such a hearth, Fig. 2 being a cross sectional view with the basin or hearth in its position of greatest depression,

while Figs. 3 and 4 show bottom views of the hearth or basin and the roller-carrying disk. The hearth has a cast iron base with cast iron side walls bolted thereto, and is lined with refractory material, while a boss with a concave recess extends downward from the under side of the center of the base, and about the boss is formed a concentric cam-faced flange, the face of the flange being in a plane that is at a slight angle to that of the base. The hearth is centrally supported by a vertical post, the upper end of which fits within the recess of the boss, and a disk is loosely fitted upon the post to rest upon the bed plate, this disk having a bevel gear about the edge of its under side that is engaged by a pinion on a horizontal shaft, driven in any desired manner. This disk carries on its upper side four wheels or rollers, as shown in Fig. 4, two of the rollers, directly opposite each other, being of the same size, while one of the other rollers is larger and the other smaller. About the top of the side walls of the hearth are flanges with hook-like projections, engaged by corresponding hook-shaped projections upon plates lined with firebrick, a loose fold of asbestos cloth being attached. To the working door of the hearth is connected a working fore plate which rests against the top of the side walls and accommodates itself to the different positions of the hearth. By the operation of the shaft revolving the roller-carrying disk under the base of the hearth, the latter is tilted to undulate the molten metal, thoroughly agitating it so that all its particles will be brought into contact with the reagent employed for its purification. The rotation of the hearth may be prevented by clutches working in slots in the fire bridge and flue bridge.

Further particulars with reference to this invention may be obtained of the Barker Undulating Furnace Company, limited, Duquesne Way, between Third and Fourth Streets, Pittsburg, Pa.

Design in the Surroundings of Houses.

A few months ago Mr. Charles Eliot, the well known landscape gardener, read before the Massachusetts Horticultural Society a most instructive paper with the above title. Assuming that every one desires to have his house and grounds beautiful as well as convenient, Mr. Eliot insisted (1) that the real beauty of what he aptly termed the "house scene" is never derived from added decoration, but must spring directly from the scene itself, and (2) that this beauty can be attained only when the house and its surroundings are thought out together as one design and composition. These truths are fundamental, and yet the ordinary practice is to build houses without much reference to the land about them, and often with no thought of so essential a matter as the way of approach. After the building is complete, some attention may be given to making the scene a pleasant one to look upon, and this is usually done by inserting flower beds or specimen plants here and there, without reference to the nature of the ground.

Illustrations of the truth of both these propositions can be found in town and country, but it is our purpose now to present a portion of Mr. Eliot's paper which relates to the suburb—a district where roads and houses dominate the landscape. Generally the ground here is level, the boundaries straight, and the lots comparatively small. In such neighborhoods the architect's share in making the scene is predominant, and an error in the style of the house is fatal to the effect of the house scene. A many-angled and many-gabled building on a smooth site, in a straight bounded inclosure, is out of keeping, and so is a tangle of bushes and bowlders, or a sharply curved approach road. This does not imply, says the editor of *Garden and Forest*, that the curve must be forbidden and the path made straight when the streets are curved or when the house door is reached most easily by a curved line, but it does mean that purposeless curvature, such as prevails in many suburbs, should be shunned. But, the editor adds, we leave Mr. Eliot to speak in his own language:

"Awkward and breadth-destroying lines of approach are the rule in the suburbs, and the architect is often responsible for them, for he frequently places the house door in such a position that the path or road leading to it must necessarily cut the ground before the house into lamentably small pieces, and he does this, too, when a little thought might perhaps have brought about that happiest of all arrangements, in which a stretch of grass as long or longer than the building is brought without a break up to the house wall itself. No subsequent planting can obliterate mistakes in these controlling elements of the suburban house scene, the house and the approach, and no planting can accomplish what it otherwise might, if, by reason of unmindfulness of the effect of the house scene as a whole, the framework of the scene is wrongly put together.

"It is seldom that a suburban lot, after the house and approaches are built, retains much of its former vegetation. A few large trees may survive the necessary gradings, but the natural ground covering is generally killed out. On the completion of the grading, grass is sown, and from the resulting sheet of green, the house walls and the boundary walls or fences rise abruptly. It is surprising to see, as one may everywhere, well designed houses, adorned within with much rich ornament, and probably inhabited by people who appreciate art and nature, standing thus naked in naked inclosures. The contrast between a handsome building and bare surroundings is sufficiently obvious in summer, but in winter in this New England climate it becomes positively startling, so that it is difficult to understand how educated people can fail to be impressed by it, and how they can longer refuse to comprehend that the house and the house ground should be treated in the same spirit.

"From another point of view this nakedness is equally surprising. Here in the suburbs is an opportunity for adding to all the usual advantages and ornaments of city life the new and delightful pleasantness of verdure, fragrance, and bloom. As a matter of fact, it is an appreciation of this opportunity that causes the first plantings in most suburban grounds. Trees and shrubs, selected for their profuse flowering or their striking habit, are set out here and there, and brilliant beds of flowers are perhaps added. Desire for ornament of this sort grows by what it feeds on, and causes the pressing demand upon the nurseryman for plants of marked appearance. The effect upon house grounds resulting from planting undertaken in this spirit is generally unfortunate. Specimens of many sorts planted promiscuously on a lawn compose an interesting though ill-arranged museum, but not an appropriate setting for a house. They wholly destroy all that breadth of effect which is so difficult but so important to preserve in small grounds. If they grow large, they interfere with the prospect and the aspect of the home, and, whatever their size, they give the scene the appearance of having been adorned to make a show, and remind one of the saying of the Greek sculptor who charged his pupil with having richly ornamented a statue because he knew not how to make it beautiful.

"An ambition to possess a collection of handsome, curious, and rare plants, like the similar passions for shells or minerals or precious stones, is entirely praiseworthy and honorable, and may well be indulged *ad libitum*, provided a place can be set apart and fittingly arranged for the purpose, as cabinets are prepared indoors for collections of curios of all sorts. Out of doors a flower garden is such a cabinet, and there is no reason that tree and shrub gardens should not be similarly arranged by those who desire to grow many striking sorts. In formal and highly decorated pleasure grounds, specimen trees are already used in this way, and with good effect. Before stately buildings and in connection with terraces and formal avenues, appropriate specimens are always in keeping, but in New England house scenes not especially arranged to receive them, they destroy the last hope of good general effect.

"With what object, then, should the planting of the suburban house ground be planned?

"I answer, with the object of helping the building, and the other controlling parts of the scene, to form an appropriate and pleasing whole. In the very smallest front yards one thing which should seldom or never be omitted can be accomplished just as well as it can be in grounds of larger area, that is, the connecting of the house walls with the ground by means of some sort of massing of verdure. Shrubs planted near the base of the house wall remove at once all appearance of isolation and nakedness, and nothing can help a building more than this. Here, if nowhere else, some evergreens should be used, and it is fortunate that in a climate in which hardy evergreens are few, the stiff sorts, like the box and arbor vitæs and the junipers, are all entirely appropriate in close connection with a building. The more irregular the structure, the more varied in detail may be these wall plantings, but if the house is of formal design, a hedge-like row of bushes may be best. The older houses in many New England villages often have bushes set out thus along their walls, and at the Longfellow place, in Cambridge, the same purpose is accomplished by a low terrace balustrade half covered by creepers.

"In grounds a little larger than the smallest, the securing of some breadth of effect by means of grass should be attended to next after the wall plantings. If there is space enough to get this openness and, at the same time, have some bushes near the street line as well as next the house, so much the better. Plant nothing which will grow to a size disproportionate to the scene. Large trees on small lots are not only inappropriate, but they shade the ground excessively and make it difficult to grow the indispensable ground covering of shrubs. Maintaining sufficient openness, plant shrubs,also against the naked fences, or grow climbers on them if space does not permit of anything more. In large grounds give the house a setting or background of appropriate trees. Where, as in New England, climate keeps deciduous plants leafless half the year, plant for effect in winter as carefully as for the summer, use all possible broad-leaved evergreens and all the cheerful fruit-bearing and colored-stemmed shrubs, and for summer add various sorts of foliage and bloom, but keep the whole scene to its own appropriate style, admitting brilliant decoration only in detail, and conspicuous single objects only rarely, if at all. If many flowers are desired, they should be grown in a garden or in formal beds close beside the formal building. The permanent scene can be helped only in its details by the temporary beauty of bulbs and herbs.

"To appreciate that a house scene depends for real effectiveness upon its general design and not upon decoration, one need only look upon some such ground as that of the Longfellow place, before mentioned, where the planting consists of two elms supporting the sides of the house, creepers covering the balustrade at its base, and lilacs flanking the balustrade and forming a hedge along the street wall. The open space of grass is well proportioned, and the whole scene is one which, in its formal, symmetrical style, is not surpassed for effectiveness in all New England. Suitable general design is just as effective in any other conceivable style."

Chloralamid, the New Hypnotic.

From the notices which are appearing all through the German medical press, it would appear that the new hypnotic, chloralamid; is destined to occupy a prominent and, perhaps, a permanent position among the popular chemical remedies of the day. It is put forward distinctly as a rival to sulphonal, and its admirers claim for it greater virtues than they allow to that remedy. Chloralamid is an addition product of chloralanhydride, CCl_3CHO, and formamide, $CHONH_2$. It has the constitutional formula:

$$CCl_3CH\begin{cases}OH\\NHCHO.\end{cases}$$

A first advantage which it is said to possess over sulphonal is its greater solubility. It dissolves in 9 parts of water, and 1½ only of alcohol, while its mild taste and freedom from caustic properties recommend it in preference to such bodies as chloral hydrate, etc. It is given in doses of 20 to 45 grains in an aqueous solution, and it is claimed that in half an hour's time it will induce a sleep lasting about eight hours, and leaving no bad effect on the heart. It is best dispensed in solution, care being taken that no alkali is present.

Although the remedy has only been known for a short time, very numerous medical reports have already been published in reference to it, and from these it appears to have been tried at the clinics of Strassburg, Giessen, Greifswold, Bonn, Erlangen, and other places. Drs. Hagen and Hueffler, of Erlangen, have prescribed it for 28 patients, in 118 single doses. They obtained excellent results in 16 cases, good results in 10, and in 2 only they were disappointed. Reischmann, of Giessen has employed it in 52 instances, and gives as his opinion that "it acts well, will be very serviceable, and is free from undesirable secondary effects, having specially no action on the heart." Peiper tried it in 24 cases, and describes it as active, but not infallibly so, as, for instance, in cases where insomnia was caused by severe pain. Headache sometimes followed its use. Drs. Hagemann and Strauss used it at the clinic of Bonn in 15 cases. and found 15 grains sufficient to cause sleep in the ailments for which they tried it, namely, nervous diseases, 5; heart disease, 2; phthisis, 2; anæmia, 2, and others. They consider it generally very effective, though they state that it had no effect in some cases; but, they add, some patients are impervious to all hypnotics. Dr. Kny, of Strassburg, first made physiological experiments, and these being successful, he gave it to 31 patients, over one hundred times, in doses of from 20 grains to 1 drachm. According to him, the soporific effect is not so strong as with chloral hydrate, 30 grains of the latter corresponding to about 45 of chloralamid, which is what we should expect, as the relative amount of chloral is as 100 to 76·6. Its chief merit is that it does not affect the circulation. He recommends it for sleeplessness caused by nervous excitation, but not when severe pain is associated with the sleeplessness.

That it has decided merits seems evident from these reports. The investigators named are men of considerable reputation, and the fact that they criticise its weak points is evidence of the care they have taken in testing it.—*Chemist and Druggist.*

The Green Fir.

A correspondent of the *Northwestern Lumberman* says green fir trees will burn like tinder. He saw a green tree of that species at Whatcom burned half down, by simply having an auger hole bored through it, with an upward slant on one side, so as to create an air draught, and stuffed with kindling. The interior of the tree being thus ignited, the trunk burned like a torch. That struck the correspondent as decidedly against fir timber as a permanent investment. He thinks that since numerous settlers have recently gone into the Puget Sound region, and are clearing farms, the liability of fires has greatly increased, and will continue to do so in ratio with the progress of settlement.

THE electric light on the Eiffel tower, Paris, is reported to be visible at Orleans, 69½ miles distant.

A Sensible Hint from a Practical Source.

The value to the mechanic of good periodicals and papers pertaining to the business in which he is engaged is often underrated by him, and he is apt to consider that he is none the worse for a lack of knowledge about the experience, opinions, and work of others. This is a most serious mistake on his part, and one which in the end will be suicidal to his best interests. One great reason why so much progress has been made in recent years lies in the fact that the ease with which men can give the results of their labors and experience to their contemporaries or leave them to posterity has resulted in a much greater diffusion of knowledge.

In the mechanical field this circulation of knowledge has enlarged and is still enlarging the circle of men who are well posted and fully alive to all that is going on. How then can a man neglect those very means of advancement by which others are progressing? It matters not whether he be a fireman, engineer, machinist, foreman, master mechanic, or superintendent of motive power, or whether his natural abilities be great or small, if he wishes to advance with the rest of the world he must know what it is doing, and this knowledge must be derived from the pages of papers devoted to mechanical affairs. We recently heard a gentleman connected with one of the most progressive roads in the country say, "I am personally acquainted with a good many enginemen on our road, but I must confess that I don't know a single one who takes any mechanical paper regularly." We know that such an assertion would be too sweeping for general application; but there is no road on which a very large percentage of the enginemen are readers of papers pertaining to their business. Nor is this state of affairs confined to the trainmen, for we know of master mechanics who "never have time to read the papers." In some cases, however, they do the next best thing; they turn the papers over to the "boys." We think we could suggest a still better method of procedure, namely, to read them first and then turn them over to others. There are many young men who would be glad to get such reading, but who may not be able to pay for it, and there are others without any desire for it who would wake up to a realization of the possibilities in life before them if their views were enlarged. For these reasons a man is to be highly commended for putting into the hands of those in his employ good engineering and mechanical journals, but he is not true to his own interests if he himself neglects to read them.—*The Master Mechanic.*

The Evolution of Music.

At the recent Toronto meeting of the American Association the address of the retiring president, Prof. J. W. Powell, was upon the above subject, and the following is an abstract.

At the outset Prof. Powell distinguished between biotic evolution and human evolution—the one being progress in bodily functions and the other progress in culture. To the latter class belonged the subject of which he was treating. Man as a musician had not developed by the survival of the fittest. There had been no natural system of laws by which the bad musician had been killed and the good musician permitted to live and propagate his kind. There had been no system of natural selection to kill poor singers and cheap fiddlers. These laws, however, were not transferred from man to music itself. The songs of barbarism were lost in civilization, and modern music was replacing the music of our fathers. So the old grew into the new by the survival of the fittest; not by natural selection, but by human selection, for men chose to keep the music they loved the best. Music was the invention of mankind; not of one man, but of all men, of composers, performers, and hearers. It had come down the stream of time, and as the rivers grow from source to sea, so music grows from primal time to vast eternity. The growth of music was seen in four stages: Music as rhythm, music as melody, music as harmony, and music as symphony. Rhythm was born of the dance, melody was born of poetry, harmony was born of drama, symphony was born of science. The motive of rhythmic music was biotic exaltation; the motive of melody was social exaltation; the motive of harmony was religious exaltation; the motive of symphony is æsthetic exaltation. It was thus seen that music developed from the emotional nature of man, as philosophy had its spring in the intellectual nature. The earliest emotions arose from the biotic constitution—simple pleasure or pain, as felt in the body and expressed in rhythm; they were mere feelings. The feelings were idealized and became emotions and were expressed in melody; then the emotions were idealized and became sentiments, and were expressed in harmony; then the sentiments were idealized and became intellectual conceptions of the beautiful, the true, and the good, and these were expressed in symphony. Was there a new music for the future? The science of music answered "Yes." Music had been chained to "form" and imprisoned in the bastile of musical intervals and guarded by the henchmen of mathematical dogmas. But a few great musical composers, like Wagner, had broken the chains and burst the bars and killed the gaolers, and they sang their liberty in strains of transcendent music. When it was desired to cultivate skill in musical performance, it was necessary to cultivate the art in the individual in the same order in which it was cultivated in the race; and he must first master rhythm, then melody, then harmony, then symphony. Then the love for music must be acquired in the same order. No one could love a symphony or an opera who did not first love song. If you would love the higher music, you must love the songs of the people; and to affirm that you loved a symphony or an opera or a cantata, but that you did not love a song, was like averring that you loved a garden, but do not love a rose; that you loved a bouquet, but did not care for a lily; for a symphony was but a bouquet of melodies, and an opera a garden of many flowers. Happy was the home that was filled with song, where boys and girls sang the melodies of the people, and where they made these melodies more musical with the violin, the piano, or the flute; for to music was consigned the purest joy.

THE VICTOR TYPEWRITER.

This is an ingenious little instrument, beautifully made, light and simple, yet capable of doing elegant typewriting with much rapidity. The register and alignment are perfect, the paper is easily put in and removed, all kinds of characters may be printed, and it cannot easily get out of order. There are less than one hundred parts in its construction. Probably no other machine combining so many convenient and excellent qualities in so small a space is sold at so low a price, namely, fifteen dollars. It weighs only five and one-quarter pounds, occupies 8" × 12" space, and can be used on any desk or table, or even on the knee.

The general construction will be seen by reference to the engraving. The letters of alphabet and characters are arranged on the arc in front. In working the instrument, the operator moves the pointer over the

THE VICTOR TYPEWRITER.

letters until the desired letter is reached. This movement turns the vertical printing wheel seen in the center of the cut. The printing wheel carries on its edge a series of springs, each of which has a printing letter on its extremity. The movement of the pointer gives corresponding movement to the printing wheel, and when the pointer is stopped upon or over a given letter on the arc, the corresponding letter on the printing wheel is brought into proper position for making an impression, which is done by pressing down the finger piece seen at the left. This pressure pushes a stud against the back of the spring letter, and makes an impression on the paper. The latter is carried between two rollers on a sliding carriage, that moves longitudinally behind the printing wheel, the relative positions of the parts being shown in the engraving.

This instrument is an admirable specimen of mechanism. It has eighty characters, embracing capitals, small letters, figures, fractions, etc. Its scope is extensive. Machines for the Russian, Spanish, and German languages have been constructed. The writing is always in sight of the operator. It prints postal cards, envelopes, etc., without bending. It prints close up to the edges of the paper.

This machine is used in the SCIENTIFIC AMERICAN office, and the above remarks are based on our experience in the use of the instrument.

For further information address the Tilton Manufacturing Co., 115 Purchase Street, Boston, Mass.

New Semi-Incandescent Lamp.

M. Henri Pieper, Jr., of Liege, has brought out a new type of semi-incandescent lamp. The lamp consists of two horizontal rods of copper, set in line with each other, but separated by a space of about 3-16 of an inch. A thin fluted carbon rod is set vertically, and rests upon the ends of the copper rod, forming a bridge across. The current passes through the copper rod and through the point of the carbon rod, which is thereby rendered brilliantly incandescent. The copper rods are supported on spring hinges, and if the carbon should break, they will rise slightly until two contacts at their outer ends come into action, thus automatically short-circuiting the lamp. The wear of the copper rods is exceedingly slight, the carbon only being consumed. Some lamps of this type have been sent to the Paris exhibition.

Correspondence.

Portable Sun Dials in Sweden.

To the Editor of the Scientific American:

In the SCIENTIFIC AMERICAN SUPPLEMENT, No. 715, I saw the article about sun dials. Please let me tell you that those dials are not any curiosity by any means in Sweden. Fifteen years ago, when a boy and going to school, I had one, and a good many of my comrades had others, all similar to your illustration No. 1. Those dials had a movable narrow band that could be adjusted to every month or part of the same. I believe that said dials are yet in the market in Sweden, and could be bought for a few cents apiece.

ERIK ENEQUIST.

Long Island City, N. Y.

Artesian Wells in Iowa.

To the Editor of the Scientific American:

In an article, "Artesian Wells" in Iowa, in SCIENTIFIC AMERICAN, July 13, the writer was laboring under a misapprehension when he states "there are no artesian wells in Iowa west of the Wapsey River." I live in Wright County, on the banks of Boone River, near Eagle Grove Junction, and on our fourteen hundred acre farm we have six artesian wells, one of them a real spouter, with a flow of sufficient force to throw water twenty feet high.

In townships Nos. 90, 91, 92, and 93, north of the base line, and in range Nos. 24, 25, 26, and 27 inclusive, there are more than a thousand artesian wells, some of them with a pressure equal to two atmospheres.

On the low lands near the river the well drillers find it a difficult job to sink a well and pipe it successfully. This flowing water is generally found in the quicksand or water gravel which lies on the Keokuk limestone formation, from 100 to 200 feet below the surface of the upland prairie, and is supposed to have once formed the old ocean's bed. Resting on this bed of water gravel is a layer of shale, hard as a rock, and impervious to water, called by the well drillers hard pan, while above to the earth's surface it seems to be drift or conglomerate.

This stratum of quicksand seems to extend across the State, occasionally cropping out in the rivers and forming living springs—starting at Lake Okobiji, in Dickinson County, and running southeast to the Mississippi, with a fall of about seven feet to the mile.

This artesian water is strongly impregnated with iron, sulphur, and magnesia, in solution, and of a temperature of ten to twelve degrees above freezing, making it a cooling tonic to drink in hot weather, and a number one drink for horses and cattle in our long, cold winters.

N. B. PAINE.

Eagle Grove, Iowa.

A New White Lead Factory.

The company formed to work the improved process of making white lead invented by Mr. J. B. Hannay, F.R.S.E., of artificial diamond fame, have acquired five acres of ground at Possilpark, a suburb of Glasgow, on which extensive works are now being erected. The plant to be installed is intended to deal with not less than 12,000 tons of lead ore per annum, and by Mr. Hannay's perfected method the finished product will be turned out in the short space of six days; indeed, as a test of its expeditiousness the whole process has been completed, and the white lead ground in oil, three days from the arrival of the raw material at the works. By the Dutch method hitherto in vogue months were required to achieve the same result, and a frequent handling of the lead and the chemicals used for its preparation by the workpeople—an obnoxious condition entirely obviated by the new method—so that the Possilpark works will not come within the scope of the White Lead Act. The now industry enters on its career under the most promising auguries.—*Chem. and Druggist.*

Sawdust.

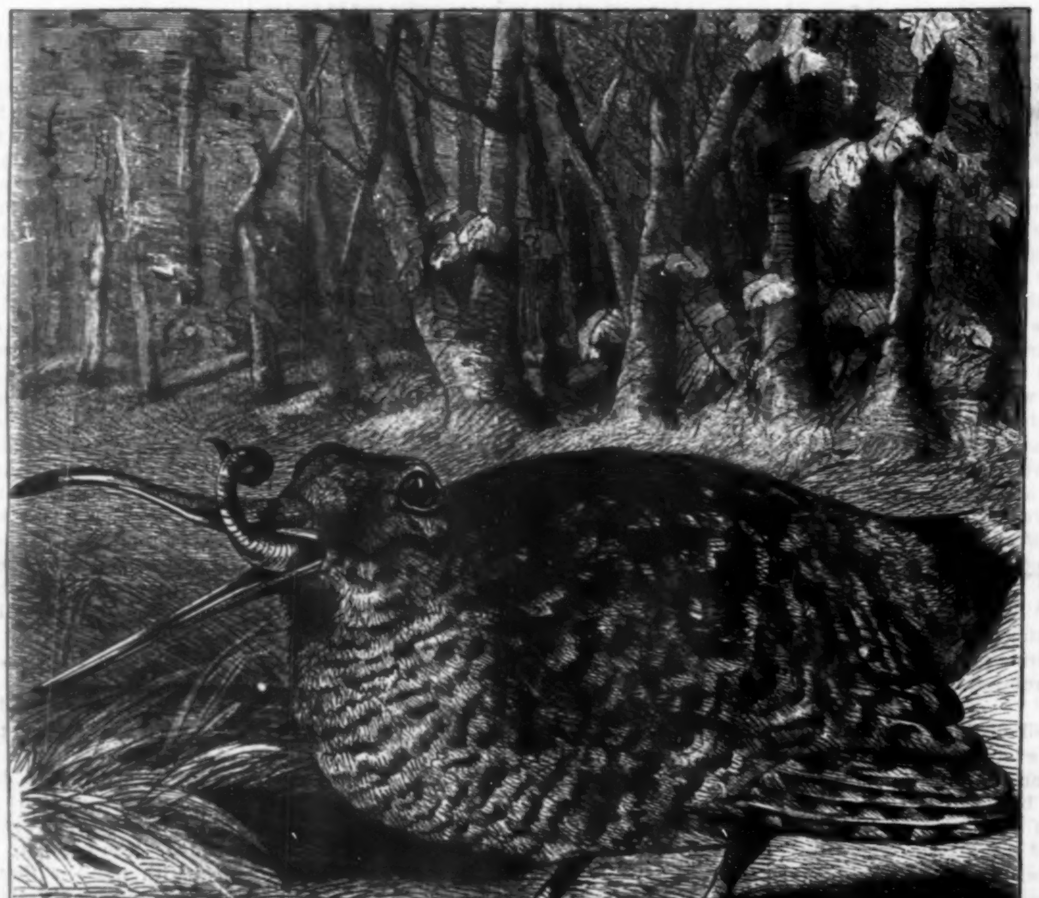
There is evidently great need for a new invention for the cheap and easy utilization of sawdust, and if inventive people would study the subject doubtless something practical might be realized. In Canada the depositing of sawdust in the rivers is forbidden by law. Recently there was a conviction and fining of a prominent mill owner, at Peterboro, for depositing sawdust and mill refuse in the Otonabee River, in contravention to the regulations of the department. Mr. Irvine, the defendant in the case, was fined $50 and costs or twenty days' imprisonment. In rendering judgment, the magistrate said that the evidence showed that large quantities of sawdust escaped from the defendant's mill into the Otonabee River, which river contained valuable fish and was navigable for steamers. It was well known, he said, that the mill refuse from the Peterboro mills for the past forty years had been freely emptied into the river, and that for twenty miles below the town the banks of the river were lined with accumulations of sawdust, and that at the detrenchment into Rice Lake the mouth was almost entirely closed. It is understood that the government has instructed its inspectors to rigidly enforce the sawdust regulations.

THE WOODCOCK.

These long-beaked migratory birds, which are as interesting to the gourmand as to the hunter, are in Germany only for a short time in the spring and fall, during their passage through the country. The woodcocks remain concealed in the darkness of the woods all day and do not leave their hiding place until it begins to grow dark, then, in the spring, they first fly in zigzags around the edges of the woods, often in twos or threes, finally coming to the open, damp places of the woods, to the pastures, or to the edges of water lying near the woods, in search of food, which preferably consists of different kinds of worms and insect larvæ. In the morning twilight the woodcock repeats this zigzag flight and searching for worms. At their breeding places they fly in this same way again as soon as the young brood is able to take care of itself, but in the late fall the birds seldom move in this way. They then generally hurry to the feeding places.

In these places the ground is perforated by numerous small holes, each having a diameter about equal to that of a thin lead pencil, which are formed by the continuous pushing in and pulling out of the woodcock's long bill. The sensitive soft point of the upper bill forms a feeling apparatus with the help of which the bird discovers the presence of a worm under the surface of the ground. He possesses the power of arching the upper part of the bill from the middle of its length and then closing the points so as to grasp the worm. This curving is caused by the displacement of a part of the jaw bone, and the elasticity of the long upper jaw brings it back into place. This peculiarity was known to hunters as early as the seventeenth and eighteenth centuries. Von Gochhausen (Not. Venat., 1710) wrote as follows on the subject: "This bird can (when searching with his long beak in a swamp and finding a worm) press the points of his bill together for about a finger's width, and then separate it beyond like nippers," etc.

This and other writings have been forgotten, because the curving of the bill generally occurs while working under the surface of the ground, and consequently tame birds are seldom seen to do it. Long years ago the writer had the good fortune to see this movement made by a tame bird, and published an account of his observations in 1865. As already stated, the birds sometimes curve their bills when not working in the ground, particularly when devouring large worms. The accompanying illustration was taken by the writer from a living specimen.



THE WOODCOCK.

The woodcock does not live long in captivity, his inclination to migrate shows itself continually, but he is not afraid of men and never fails to eat the worm which is thrown to him. In spite of his voracity, however, the woodcock generally grows thin, when in captivity, and finally dies.—*Illustrirte Zeitung.*

Deep Sea Fishing with the Electric Light.

Every one has heard of the Prince of Monaco, who reigns with great dignity, when he is at home, over a community of seven thousand souls, but much prefers to sail about in his yacht, devoting himself to scientific investigations, which he carries on with an ardor and success which will probably make him the most famous of all his distinguished family.

Among the peaceful exploits of the prince none are more conspicuous than his successful investigations into the natural history of the bottom of the sea, which have resulted in bringing to light, from regions where it was supposed that no life could exist, creatures of the most extraordinary character, huge, phosphorescent fishes, which illuminate the dark water through which they swim; crustaceans and mollusks of new and unheard-of shapes.

By a happy idea, the pavilion of the Principality of Monaco at the Paris exposition is in great part devoted to the display of the interesting apparatus used in his researches by the prince, whose people seem pleased to identify themselves with his work, and thus share in the distinction which he has won.

In the investigations of the prince, which have extended from the banks of Newfoundland to the coast of Africa, one of the most important objects was originally the determination of the flow of ocean currents in the North Atlantic, and many hundred floats have been sent out and thermometric observations at different depths taken, to ascertain, for instance, the movement of the Gulf stream. Incidentally, it became necessary to make soundings at great depths, and an apparatus was invented by which not only the ocean was sounded with perfect accuracy in the deepest places, but thermometric observations of temperature were made at a depth of two miles from the surface. To make these observations nothing was needed, in principle, but a long wire carrying a self-registering thermometer and a very heavy weight, several tons in some cases, secured in such a way as to detach itself on arriving at the bottom, and a delicate dynamometer, over which the wire ran, and which showed, by the sudden diminution of the strain, when the weight reached the ground; but when the attempt was made to bring living creatures from such depths, great difficulties were encountered, and overcome by most ingenious means.

The cage in which the submarine animals were caught, according to *Le Genie Civil*, consisted in a cylinder of wire having three conical entrances, like those of a lobster pot, and weighted, like the sounding wire, with detachable weights. It was, however, very unlikely that at these immense depths, where the darkness is practically total, any fishes would voluntarily find their way into the trap, and steps were taken to attract them by a light placed inside it. Obviously, no light was available but an electric light, but to get an electric light to burn a mile or two under water was not easy. To send the current from above was impracticable, as the friction of the thick insulated wire would cause it to break before the trap could be drawn up, and the only resource was to supply the incandescent wire from a battery in the trap.

Here, however, another difficulty appeared. The battery, which must be of considerable power, needed to be inclosed in a box of some kind to keep it from being affected by the salt water, and as the hydrostatic pressure at such depths was six or seven hundred pounds to the square inch, it was found impossible to make a suitable box which was not crushed before it reached its destination. At last, however, this trouble was overcome by the curious device of connecting the box with a balloon.

The balloon was made of cloth dipped in India rubber, and so arranged that the air in it was in communication with that in the battery box. On sinking the apparatus, the hydrostatic pressure, being virtually uniform all around the balloon, compressed it equally on all sides, forcing the air out of it into the battery box, until the pressure inside the box and balloon exactly balanced the pressure outside.

This process went on to any extent, so that at the bottom of the sea, although the balloon was reduced by the enormous force exerted on it to a small fraction of its original size, it still kept the internal and external pressures equal. On raising the apparatus again it expanded as the pressure diminished, and brought the battery box to the surface uninjured.

So successful was this device, that, not content with capturing deep sea fishes with it, the prince and his assistants propose on their next expedition to send down a photographic apparatus and bring back negatives of the bottom of the ocean, as seen by the electric light.—*Amer. Architect.*

How to Succeed.

That is what every person wishes to know, and the *Northwestern Mechanic* has undertaken to inform one class of workers how to do it. The man who is to succeed as a mechanic, the writer concludes, must be a queer mixture of go-aheadness and conservatism. He must stick to the old ways, and yet be alive to all that is new and savors of advance. To hold to old methods and practice is to be left behind in the race, while to adopt everything new that presents itself would quickly relegate to failure the unfortunate who attempted it. To sift out what is good, and to reject the worthless, is the problem the successful mechanic has to solve. It is but a continual example of the truth of Darwin's theory of the "survival of the fittest." The mechanic preserves the best methods, and is in turn kept alive by the very methods he has preserved and put to work. The successful mechanic was enabled to succeed because he possessed the faculties of perceiving what was useful and what was worthless. Once this point determined, the rest is easy. The good is to be kept, the worthless discarded, but in knowing what to keep lies the secret of success.

Must the necessary qualities be born in a mechanic, or can he be educated to it? Both. To be a successful mechanic a man must possess certain characteristics, but many kinds of men will make good and successful mechanics. To begin with, the would-be success must be a thinker. He must be able to reason clearly from cause to effect, and instead of sitting down and waiting for something to turn up, he must think out ways and means of forcing the desired results from the material at hand. He must be able to make the best of things, and all the "born-in" characteristics necessary is that aptness for mechanics without which no man can put his heart and soul into it as a life work.

Some men are better mechanics than others. They obtain better results from the same material than some of their co-laborers. The reason of this is that the men in question are better adapted to the work they have to do. In other words, they are the "fittest," and will survive accordingly. They succeed better than we do because they have better things to work with, brains included. We might do better should we think more and study out better methods and opportunities.

The Best Remedy for Venomous Snake Bites.

L. G. Lincecum, M.D., writing from Texas to the *Southern Practitioner*, says: Permanganate of potash is a successful remedy. I have treated more than one hundred cases in Texas, and have used whisky, soda bicarb., spt. ammonia, turpentine, chloroform and other remedies, but have found that potas. permanganas in one or two gr. doses hypodermically, and chloroform, locally and by inhalation, are undoubtedly the most certain and successful remedies in bites of venomous reptiles I ever used. I have never seen a case treated with these two remedies result fatally.

Trial of the Charleston.

The inspector of machinery of the U. S. S. Charleston, Chief Engineer Wm. Smith, U.S.N., in a report received by the Bureau of Steam Engineering, September 4, gives the first detailed and authentic intelligence concerning the official trial of that vessel. After giving the particulars of the preliminary runs during August 21 and 22, he says of the official trial which took place August 23:

At 1 o'clock the fire rooms were closed and at 1.10 a third trial was begun and continued without interruption for six hours, the machinery and boilers the whole time performing admirably; the main engines with but little vibration—less than with the old screws; and the boilers furnishing more than sufficient steam, the safety valves blowing part of the time. The throttle and stop valves were not touched throughout the trial, nor were the cut-offs until 5.20 P. M., when they were changed on both engines from 0·7 to 0·74 in the horse power cylinders.

Between 2.35 and 2.45 P. M. it was necessary to open the starboard horse power cylinder drains a few times, which caused a temporary decrease in the speed of that engine.

There was no heating of slides, journals, or bearings, though water was turned on the crank pins and a drip on the slides to make a lather with the oil.

The telescopic oilers on the crank pins worked well, except that the starboard oiler required watching and occasionally water.

The performance of the air pumps, crosshead slides, and thrust bearings showed the necessity for the changes which were made since the trial in May; all the parts mentioned giving great satisfaction.

Live steam was admitted into the receivers and all the fire room auxiliaries, dynamo engine, etc., exhausted into the S. condenser.

Two or three rings of the port thrust heated slightly, but were easily controlled by a small stream of water.

Average from 1.10 to 7.10 P. M., August 23, 1889: S. engine—steam, 85 lb.; receiver, 23·8; vacuum, 26¼ in.; cut-off, 0·712; throttle, 8; revolutions, 114·7. P. engine—steam, 86 lb; receiver, 22·8 vacuum, 26 in.; cut-off, 0·712; throttle, 8; revolutions, 113·26. Average revolutions per minute from 3.10 to 7.10: S. engine, 115·35; P. engine, 113·67.

The boilers worked admirably and gave no evidence of priming. The blowers were run at an average of about 500 revolutions and the air pressure maintained at about two inches of water.

From some of the cards which were worked up on board the horse power for main engines and auxiliaries showed about 6,700, and it is believed this will be close to the result which will be determined by the board.

During the first part of the six hour trial the sea was rough and following, and the wind, force 6—7, on the starboard quarter. The engines raced constantly, especially the starboard one, and the ship rolled heavily. After 4 P. M. the force of the wind dropped to 2—3, and the sea was smooth, the ship being in Santa Barbara Channel.

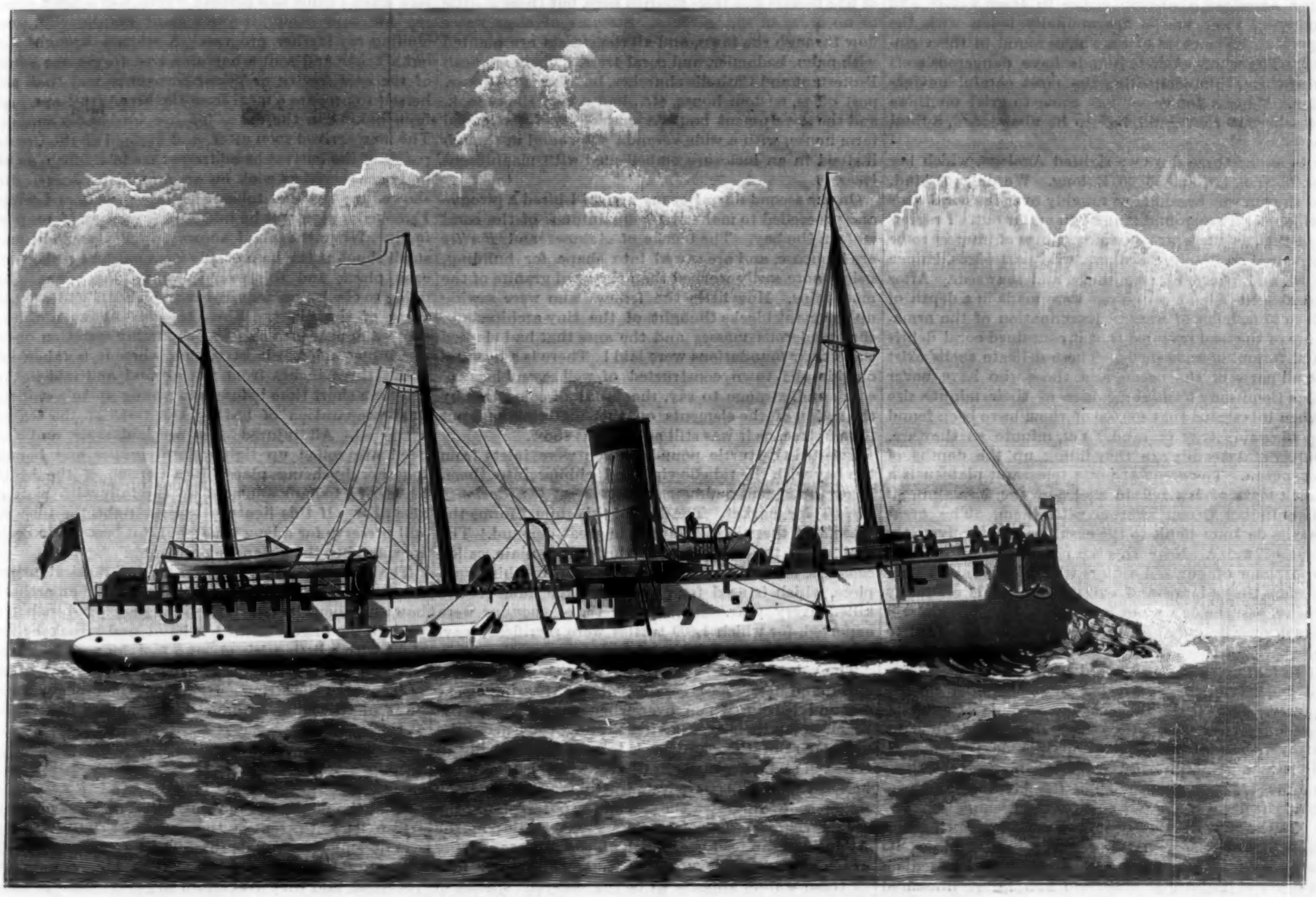
The average speed by the patent log for the six hours was 18·167 knots, and the maximum 18·75 knots.

On August 21, during the second trial, the speed was measured by points on land at 19 knots.

After the trial the ship was run to San Pedro, where 50 tons of coal were taken on board on August 24, and at 5.25 P. M. the same day the ship left for San Francisco, arriving at 7.47 A. M., having been off the head in a fog during the night.

TYPES OF THE FRENCH NAVY—THE CONDOR.

The French government has lately constructed several "croiseurs-torpilleurs," or torpedo cruisers, of this class, to act both as lookout ships and as torpedo boat catchers. The Condor, which was built in England at a cost of £80,000, and was launched in 1885, is constructed of steel. Her dimensions are 216 feet 6 inches length, 29 feet 3 inches breadth of beam, with a displacement of 1,280 tons, and 15 feet 5 inches draught. She has twin screw propellers, with engines of 3,800 indicated horse power, and attains the speed of 17·70 knots an hour. Her armament consists of five breech-loading rifled guns with caliber of ten centimeters, six machine guns, and five fixed tubes or light carriages for discharging Whitehead torpedoes. The sister vessels built in France, the Faucon and others, are of the same dimensions; the Faucon, designed by M. De Bussy and built at Toulon, has her hull divided into ten watertight compartments and protected by an armored deck from end to end. This vessel is not dependent on her canvas, but has three signaling masts carrying Hotchkiss machine guns, and fitted with steadying sails.—*Illustrated London News.*



TYPES OF THE FRENCH NAVY—THE CONDOR, TORPEDO CRUISER.

Raw Materials.

All the products of the earth are, in their turn, finished commodity and raw material. Coal and ore are the finished commodity of the miner, and yet they are only the raw material of which pig iron is made. The latter is the finished commodity of the smelter, and yet it is but the raw material of the puddler and of him who rolls the bar. The bar, again, is the raw material of sheet iron, and that, in turn, becomes raw material of the nail and the spike. These, in time, become the raw material of the house, in the diminished cost of which are found concentrated all the changes that have been observed in the various stages of passage from the rude ore—lying useless in the earth—to the nail and the spike, the hammer and the saw, required for the completion of a modern dwelling.—*Cary, Principles of Social Science.*

Pilot Knob Iron Ore.

The St. Louis Ore and Steel Company have discovered a new, and perhaps very important, body of iron ore at their Pilot Knob mines. We are not in possession of all the facts relating to the matter, because the company have prospected with the greatest secrecy possible, and, furthermore, decline to give any statement in confirmation or denial to the press at the present time.

From what can be gathered from other sources, however, it appears that the discovery was made on the northeastern side of Pilot Knob hill. Six holes were drilled on this part of the property in a "group" at distances of about 600 feet apart, with the result of encountering ore in each instance. That taken from the last hole put down assayed 63 per cent metallic iron. So pleased were the company with the result of these researches that, according to the *Iron County Register*, they "have begun employing miners for the immediate working of the unearthed vein."

The Pilot Knob mine has an interesting history. When discovered some fifty years ago, it was supposed to be a solid mountain of iron, and that has been the text book and popular notion concerning it until very recent years. Hence, it was a surprise to a great many people when the report went out some two or three years ago that the ore had pinched out, and that the company were cutting out the pillars supporting the roof. That meant that the great mine, the producer of millions upon millions of the finest Bessemer ore ever known, had failed.

The old mine was an ideal iron property. The Knob itself, rising in the form of a frustum of a cone some 500 feet above the valley, is easily "majestic." Near the top of it was what at one time appeared to be an inexhaustible body of ore. The vein was so thick that in the worked-out portions the roof was almost as high as the ceiling in a cathedral. Moreover, the mine was at all times dry and comfortable; and when in recent years it was lighted by electricity, it presented a truly grand sight about the workings. The ore, too, was easily handled, since gravity furnished the motive power for running the ore down to the railroad tracks, about three-quarters of a mile distant. The cable returned the empty cars also. A furnace was operated at the base of the mountain for several years, but was finally closed down on account of the question of fuel. —*Age of Steel.*

The Seychelles Islands.

NICOLAS PIKE.

As the readers of the SCIENTIFIC AMERICAN have recently been interested in an article on the "Coco de Mer,"* one of the vegetable wonders of the world, and as I am aware but little is known here of this group of islands, I thought a sketch of them would be acceptable at this time. While at Mauritius I had long wished to visit the Seychelles, which were under my jurisdiction as consul of the United States, to study their fauna and flora. Chance gave me the longed for opportunity.

In 1871 the English frigate Forte, the flagship of the Asiatic squadron, Rear Admiral Cockburn, came to Port Louis, the capital of Mauritius. Soon after his arrival the admiral gave me an invitation to visit the Seychelles and other islands in the Indian Ocean in his ship. I was but too glad to accept so good an offer, as it enabled me to carry out my wishes and transact some official business at the same time, and on the 19th of August we steamed away on our voyage.

In latitude about 16° 15', longitude 50° E. we passed near the St. Brandon or Cargados Islands, inhabited principally by some fishermen, who salt fish, and a few Creoles, who make cocoanut oil to export to Mauritius. Our American whalemen cruise in these waters, and many of their vessels are annually laden with the spoils of the monster sperm whales found in this vicinity. The whole of these islands have dangerous reefs near them, thus compelling the most careful navigation. Many a fine vessel has come to grief on these treacherous rocks, and had to be abandoned, a total wreck

In about three days we sighted Agalega, which lies in 10° 30' S. lat. and 56° 30' E. long. We did not land, as the sea was breaking so roughly over the coral reefs which nearly surround it and extend far out. I regretted this, as there are so many things of interest to be procured on it—among others, wild partridges, guinea fowl, and peacocks, rare shells, and seaweeds. After passing the island, soundings were made in a depth of 20 to 25 fathoms of water. Examination of the armature of the lead revealed that it contained coral debris and foraminiferous shells. These delicate shells exist in all parts of the ocean, and those who have never seen them may form some idea of their minute size when it is stated that 400,000 of them have been found in 46 grains troy of sand. Yet, minute as they are, surely and steadily are they filling up the depths of the ocean. The great Atlantic telegraph plateau is a bank formed of the dead shells of the foraminifera. The Indian Ocean swarms with them. The great Sayha de Mala bank to the east lies in only five fathoms of water. Near this is a noted whaling ground, and some of our old sailors who have cruised here declare that a large and extensive bank is gradually rising, and the day is not far distant when the sea will break over it, and another dangerous reef be added to the perils of these seas. It is supposed these foraminifera feed on the infusoria which they have the power of electrifying or paralyzing by some hidden electric power. Thus these, the most microscopic of animals, are unpitying flesh eaters, becoming formidable destroyers by means of a homeopathic dose of poison. It is in a great measure from the myriads of these minute creatures that much of the dazzling light proceeds at night in various parts of the ocean.

On the 25th of August, after a most interesting and delightful voyage, we entered the bay of Mahe, its crystal waters smooth as a mirror, and as I gazed on the grand outlines of mountain and forest presented to our view, I was already reveling in the anticipation of pleasant hours spent in exploring the one and climbing the other. Before landing, I will give an outline of the position and general character of this interesting group of islands.

The Seychelles archipelago is one of the dependencies of Mauritius, and lies about 930 miles from it, and about the same distance from Africa, a little north of the Zanzibar coast. There are about thirty-five or thirty-six islands, of which Mahe is the principal. It is probable that this group was known to the early Phenicians, who were constantly trading up and down the African coast. There is certain evidence of their being visited by the Arabs, as in the Ile du Nord there are old Arabic inscriptions cut on the rocks. In cutting down a large tree in a forest at Mahe, an arrow head of hard black wood was found embedded in its heart. It must have lain there for ages, as the wound in the tree was so perfectly closed that the arrow was only discovered when sawing it into planks. It is possible that the Arabs of the Zanzibar coast manned their boats with slaves from the Lupata Mountains, who are well skilled in the use of similar weapons.

In 1502 Vasco de Gama, the Portuguese navigator, discovered these islands on one of his voyages to India, but they were not considered worth colonization and were abandoned. The first authentic history of them began in 1742, when the French Capt. Picault, of the Elisabeth, rediscovered them and named them "Les iles de la Bourdonnais," and the largest one "Mahe," after one of the best French governors Mauritius ever had—Mahe de la Bourdonnais. The name was afterward changed to "Les Seychelles," after Vicomte Herault de Seychelles. In 1792 they were captured by the British, but not fully taken possession of till 1815, when they were definitely ceded to them by the French.

These islands vary in their formation, some being entirely coralline, seeming to rest on a raised platform of coral and sand, while others are wholly granitic, thus differing widely from Mauritius and Bourbon, which are volcanic. Some of the group are little more than mountain tops. Silhouette rises above 2,000 feet, Prashu and Ladigue to 1,500, and the Morne Blanc mountain of Mahe is at least 3,000 feet above sea level.

To return to the bay of Mahe. It is about five miles wide, with good anchorage within it, but the entrance through the channel between the coral reefs is so intricate as to render it difficult of approach without a good pilot in the day time and impossible to a stranger at night. We landed at Victoria, the only town of the group, which lies on the southwest of Mahe, on a plateau between the Troisfreres Mountain and the sea. The houses are of wood, of one story only. The streets are short, narrow, and slope to the sea. A profusion of fine flowers and trees flourish here, but there is little or no order in the gardens. Streams of clear water flow through the town, and all the streets are planted with palm, badamier, and coral trees. There are both Protestant and Catholic churches, but the court house, post office, custom house, etc., had a very shaky look, and the government house resembled an old-fashioned farm house, with a wide veranda all round it, though it stood in an inclosure embellished with magnificent trees.

On the second day after my arrival I hired a pirogue and proceeded to make the acquaintance of the coral reefs in the bay. The blocks of *Astræas* and *Porites* are immense, and are sawed into shape for building, being more easily worked than the hard granite of the mountains. How little the fellows who were sawing up the giant blocks thought of the tiny architects of the ponderous masses and the ages that had elapsed since their foundations were laid! There is a hospital outside the town constructed of well sawn blocks of coral, and, strange to say, the usual discoloration by the action of the elements on this material had not taken place, as it was still as white as snow.

I visited the turtle pounds, which were inlets from the bay with the tide flowing and ebbing into them. They contained numbers of green turtles (*Chelonia viridis*) for market. The flesh of this animal forms the "beef" of these islands, and is in great demand. The shell, with the exception of the center plate, called *caouane*, is worthless, yet for the sake of this small piece, which is used for veneering, large numbers are killed every year. In 1862, 600 lb. of *caouane* were exported, for which 1,800 turtles were sacrificed, leaving 490,000 lb. weight of good flesh to rot on the shore.

The valuable hawksbill turtle (*Caretta imbricata*) is also found here, and is caught both by spearing out at sea and turning them over when they come to the beach to lay their eggs. After killing the turtle, the upper part of the carapace is taken off, a hole dug in the sand and a fire made in it, over which is placed the hollow shell. This is covered with seaweed, and the steam soon separates the laminæ or outer plates, the only parts used for commerce. These turtles in the Atlantic Ocean feed very much on the *Zostera marina* or sea grass, but I saw none of it here, and their food in these waters appears to be the different species of *Caulerpa* and *Sargassum*. The eggs of both turtles are considered great delicacies and are diligently sought for, and fetch quite a high price in the market.

Only the littoral and a portion of the south of Mahe are available for purposes of agriculture, the rest being a series of lofty mountains, with here and there a plateau cultivated by the natives. Near the town is a bridge that spans a deep ravine, and I paused there to admire the rich and varied vegetation. There were large clumps of the feathery bamboo, many 40 to 50 feet high, that give such elegance to tropical scenery. Ferns, flowers, and grasses were in profusion, with bright green lizards sporting over them. I met groups of Mozambique men and women going to work in the town. One man had a curious musical instrument called a fiddle, but it was not like one, nor was it played with a bow. There was a straight piece of wood with three or four notches cut in one end, which served the purpose of frets on a guitar. Half a large gourd was affixed to it as a sounding board, the hollow side being held against the breast when played on. Two banana fiber strings were fastened at one end and then drawn tight and secured in the notches. They were struck by the fingers of the right hand, and the thumb of the left assisted. The music was plaintive, in a minor key, but not unpleasant.

I passed through a large grove of cashew trees (*Anacardium occidentale*) laden with fruit. I ate of the ripe ones, as they were old acquaintances in Brazil, but the natives were afraid and would not touch them. I saw cotton growing, but very sparsely, yet that produced here is said to be equal to the best Sea Island, and the climate and soil are peculiarly suited to it. During the French occupation of the Seychelles, fortunes were made in cotton growing, indeed up to 1827; but at that time America began to fill the European markets, prices lowered, and the trade gradually dwindled away and is now neglected. Guavas and jamrosas gave grateful shade and fruit, for the heat was great. I had long known that these trees were the favorite food of the curious leaf fly (*Phyllium siccifolium*) and their branches its especial habitat. So I began to hunt for it. The peculiar dress nature has bestowed on it enables it to elude the pursuit of the uninitiated. In form the flies imitate leaves, and the veining of their wings keeps up the resemblance. Some grow over three inches in length, and all have curious leaf expansions on the legs, and when disturbed have a queer way of doubling themselves up till they look like crumpled leaflets. The males are much smaller than the females. I found some at last with their eggs, but the red ants destroyed half of them for me. Curious *slowgoers*, as the natives call them, but very wide-awake chameleons, were crawling over the grass and bushes. This is said to be a species peculiar to these islands and unlike the one on the African coast. I had been gradually climbing the mountain side when I came to a plateau where was a clean-looking hut, and behind it rose a giant granite cliff, precluding my further progress. A woman brought me out a bench and sent a boy up a tree to get me some of the *coco tendre*, or young cocoanuts, and then set herself to prepare a meal from the bread fruit she had been baking in the ashes for her husband's supper. The man arrived soon after, and instead of the Creole patois of the natives he addressed me in English, as he had once served as cook on an American whaler. He showed me excellent tobacco he had grown, and while I smoked a pipe of it he told me his method of preparing it. When the plant shows flower, every bud and small shoot at the base of the stem must be picked off each plant, and this every twenty-four hours. By doing so the leaves acquire great breadth and all the vigor of the plant. When the leaf shows a thick, spotted appearance and has a gummy secretion on it of a brown color, it is fit to cut, when it is taken off about three inches from the ground and laid in the sun for a short time before being hung up to await its final preparation of having the veins of the leaves extracted. All injured ones are laid aside, and the good are rolled up tightly into *carottes* and bound together by being placed in a portion of the heart leaves of a banana and tied up carefully with plaited aloe fiber. If this ligature is kept tight, the tobacco will preserve for a long time; but if it becomes loose, it is exposed to the air and soon moulds.

The man showed me another kind of musical instrument, called a *bobre*. It is just the form of an archer's bow and about its size. The string is played with the back of the fingers of the left hand, and struck by the right with a little stick about a foot long, and on the end of it is tied a bundle of small pebbles that rattle as it touches the string. He played some merry tunes on it and the children danced, the mother figuring in at times.

(*To be continued.*)

* See SCIENTIFIC AMERICAN of August 17, 1889.

Steam Plows.

That the method of plowing will soon be revolutionized to a great extent on the prairies of the West there can no longer be any doubt. The farmers are already clamoring for a steam plow that will be simple and practical, and they are certain to get it sooner or later. In this age of invention and improvement it is said that whenever a want becomes general, there always springs up something to supply the necessity. Every mechanical implement now in use, calculated to cheapen production and save manual labor, has arisen from the urgent needs of mankind, and hence the steam plow, suitable to the farmer of a few hundred acres, will sooner or later be an assured fact.

The self-binder did not make its appearance in the harvest field until the Western prairies furnished more grain than could possibly be harvested by hand to a profit, and the steam thrasher soon followed because the same want was the parent of both. The same may be said of the broadcast seeder, the press drill, and the gang plow. The old-style grain cradle that our fathers used to swing, with their wide scythes and five crooked wooden fingers or prongs, is a thing of the almost forgotten past, and has been laid aside forever, with the old-fashioned wooden mouldboard plows. In agriculture, as in everything else, new methods have been inaugurated, and in every step of progress the object has been to save labor and make farming easier and more lucrative.

There is really little in the way of successfully applying steam power to plowing and harrowing, now that there are so few "stump fields," and a newspaper called *Stoves and Hardware*, printed in St. Louis, and principally devoted to the interests its title implies, thinks that the wonder is that some inventor, who would like to make his fortune out of it, has not come forward with a small and simple steam plow that will fully serve the purpose.

Natural History Notes.

The Speed of Fishes is almost an unknown quantity, it being, as Prof. G. Brown Goode says, very difficult to measure. If, says the professor, you could get a fish and put it in a trough of water 1,000 feet long and start it at one end and make it swim to the other without stopping, the information could be easily obtained; but fish are unintelligent and will not do this. Estimates of the speed of fish are consequently only approximated, and more or less founded upon guessing. One can tell, however, at a glance whether a fish is built for speed or not. A fast fish looks trim and pointed, like a yacht. Its head is conical in shape, and its fins fit down close to its body, like a knife blade into its handle. Fish with large heads, bigger than their bodies, and with short, stubby fins, are built for slow motion.

The predatory fishes, those that live on prey, are the fastest swimmers. The food fishes are, as a general thing, the slowest, and, consequently, are easily captured. Their loss is recompensed, however, by the natural law which makes them very prolific in reproduction. Dolphins have been known to swim around an ocean steamer, and it is quite safe to say that their speed is twenty miles an hour; but it may be twice as much. The bonito is a fast swimming fish, but just what its speed is is not known. The head of the goose fish is very large—twenty times as big as its body. It moves about very little, and swims at the bottom of the ocean. The Spanish mackerel is one of the fastest of food fishes. Its body is cone-shaped, and is as smooth as burnished metal. Its speed is as matchless as that of the dolphin, and, in motion, it cuts the water like a yacht.

Structure of Plant Hairs.—The structure of the hairs of various species of *Urticaceæ*, *Moraceæ*, *Boraginaceæ*, and *Cucurbitaceæ*, remarkable for their rigid character, has been investigated by Dr. F. G. Kohl. He finds that they exhibit a marked thickening at the apex, followed by a partial calcification or silicification. This thickening is due to the deposit of caps of cellulose placed one within the other, masses of protoplasm lying between each. This structure is easily seen in the hairs of comfrey (*Symphytum officinale*) after the calcium carbonate has been removed by dilute hydrochloric acid. It is to the deposits of lime or silica that the brittleness of such hairs is due, and that they so readily, as in the case of the nettle, enter the skin, and, being brittle, break off and allow the poison to enter.

Plants with Dulcifying Properties.—At a recent meeting of the Linnean Society, a specimen of the fruit of *Sideroxylon dulcificum*, the so-called "miraculous berry" of West Africa, was exhibited by Mr. D. Morris, the Assistant Director of Kew Gardens. He stated that the sweet pulp of the fruit, which is about the size of an olive, imparts to the palate a sensation which renders it possible to partake of sour substances, such as tartaric acid, lime juice, and vinegar, and gives them a flavor of absolute sweetness. The fruit of another plant (*Thaumatococcus Danielli*) possessing similar properties was also shown, living plants of both having been recently received at Kew from Lagos from Governor Moloney. The *Sideroxylon* is mentioned by Dalzell in his history of Dahomey, where it is stated to be used by the natives to render palatable a gruel made from bread after it has become too stale for any other purpose. Unfortunately the peculiar sweetening principle is soon dissipated if the fruit remains ripe for any length of time. Preservation in spirit, acetic acid, or sirup does not appear to favor the retention of the dulcifying principle, according to Dr. Daniell, since he found that specimens of the fruit brought to England became insipid and lost their properties. In the case of *Thaumatococcus Danielli*, however, the properties of the mucilage surrounding the seeds appears to be retained much longer when the fruits are preserved in sirup. It would be interesting to ascertain the nature of the sweet substance contained in the fruits, and it may be hoped that the Kew authorities will not let so interesting a question fall to the ground without some attempts being made in various ways, such as obtaining the dried unripe fruits, to extract the dulcifying principle of these fruits.

The Bower Bird.—At the monthly meeting of the Royal Society of Queensland, on June 14, Mr. De Vis read a most interesting paper on *Prionodura Newtoniana* (Meston's bower bird) and *Acanthiza squamata*, recent additions to the Queensland avifauna. The former was minutely described. It was first found by Mr. K. Broadbent in the scrubs on the Tully River, but its true habitat is now ascertained to be the highlands north of Herberton, where it was observed by Mr. A. Meston in the course of a short visit to the top of Bellenden-Ker. Mr. Meston brought down the first skin of a male bird, but not in a condition to permit full recognition. Excellent specimens, male and female, were afterward obtained by Mr. Broadbent near Herberton. Prionodura is emphatically a bower bird. Both its observers in nature met with its bowers repeatedly, and agree in representing them as of unusual size and structure. The bower is usually built on the ground between two trees, or between a tree and a bush. It is constructed of small sticks and twigs, piled up almost horizontally round one of the trees, and rising to a height of from 4 to 6 feet. A similar pile about 18 inches high is then built round the foot of the other tree. The intervening space is arched over with stems of climbing plants. The piles are decorated with white moss, and the arch with moss interspersed with bunches of fruit resembling wild grapes. The birds, young and old, male and female, play merrily under and over the archway. The completion of the massive bower so laboriously attained is not sufficient to satisfy the architectural impulse of the bird, for scattered immediately around are numbers of dwarf hut-like structures—gunyahs they are called by Mr. Broadbent, who remarks that they give the spot exactly the appearance of a blacks' camp in miniature.

The Pressure exerted by Seeds.—Mr. Grehant has recently made known the results of some experiments undertaken for the purpose of comparing the pressures exerted by seeds placed in a closed vessel in a current of water. The apparatus used consisted of a small Papin digester of cast iron, having a capacity of 48 cubic inches, and provided with a tight-fitting cover held in place with screws and nuts. The vessel was filled with seeds up to the middle, then there was introduced in the center a rubber bag one inch in diameter filled with mercury, into which entered a glass tube closed at the top. This tube, which passed through the cover, served as a compressed air gauge, while a brass tube extending to the bottom also traversed the cover and served to introduce the water that had to be removed. Finally the vessel was filled with seeds and closed.

With lupin seeds, Mr. Grehant found that the pressure rose to 15 atmospheres. Upon opening the apparatus he found the seeds very strongly compressed against each other, there being not the least interval between the flattened surfaces. With lentils placed under the same conditions, the pressure did not exceed eight atmospheres.

Sharks in the Adriatic.—The canalization of the Isthmus of Suez has been followed by unforeseen results—the introduction of sharks into the Mediterranean. Formerly the presence in this sea of a dog-fish that had passed around Africa and cleared the Strait of Gibraltar in the wake of some ship might have been observed every four or five years; but now the number of these terrible fishes is increasing in a remarkable manner, chiefly in the Adriatic Sea, whither the numerous ships proceed that pass through the Suez Canal.

Some time ago, there was captured in the Gulf of Fiume a large female shark that had become entangled in the nets of the tunny fishermen. At the beginning of August a sailor of the floating light of Pola harpooned a young shark in front of the bathing establishment of that city, and on the 14th of the same month another one, 7 feet in length, and about a month old, was taken in the waters of Medolino, not far from Pola. This young shark, the jaws of which were armed with teeth from $\frac{3}{4}$ inch to $2\frac{1}{2}$ inches in length, had already become a menace to bathers.

Plants protected by their Juices.—When a drop of the juice of sorrel, garlic, saxifrage, or nasturtion is put upon the tegument of a snail, the animal manifests pain and exudes abundance of its mucous secretion; yet it is not thus affected by a drop of water. When snails avoid plants marked by such juices, we have a right to regard the plants as defended by a chemical armor. The offensive substance may also be important to the nutrition of the plant, but that is not the question we are dealing with here. Many plants are evidently lacking in this means of defense; for, of some plants, all the animals experimented upon have been found to prefer fresh to dead parts. Others are never touched by them, whether living or dead. Hence we may conceive that an infinite variety may exist in the degrees of chemical armoring between total absence of protection and complete protection.

Plants containing perceptible tannin are disagreeable to nearly all animals. Only swine will eat acorns as if they regard them as food. Other animals reject them, except when they cannot get anything else. Leguminous plants containing tannin in weak proportions are eaten by horses and cattle, but snails are not fond of them. But the garden snail, which lets fresh clover alone, will eat it freely after the tannin has been extracted with alcohol.—*Popular Science Monthly.*

Heat developed by Insects.—A correspondent of *Insect Life* states that having one day accidentally taken hold of a bag of peas infested with weevils (*Bruchus*), he was surprised to find how warm it was; and he found that, while the external temperature was 71°, that of the bag was 96°. The difference was due, as he ascertained, to the fact that the weevils developed, through their work and exertions, a large amount of heat.

Medium Size as Regards Animals.—The largest animal known is the rorqual, which is about 100 feet in length. The smallest is the twilight monad, whose dimensions are 12,000th of an inch. It is evident that the middle term is one-third of an inch, about the length of the common house fly, which may, therefore, be considered as an animal of medium size in the creation.—*P. H. Gosse.*

The Weight of the Whale.—Nilsson remarks that the weight of the great Greenland or right whale (*Balena mysticetus, L.*) is 100 tons, or 220,000 pounds, equal to that of 88 elephants or 440 bears. The whalebone in such a whale may be taken at 3,360 pounds and the oil at from 140 to 170 tuns. The remains of the fosil whale (*B. prisca*) which have been found on the coast of Ystad, in the Baltic, and even far inland in Wangapanse, Westergothland, betoken a whale which, although not more than between 50 and 60 feet in length, must at least have had a body twenty-seven times larger and heavier than that of the common or right whale.

Origin of Man and the Other Vertebrates.—Prof. Cope, in a discussion of the origin of man and the other vertebrates, reaches the following conclusion: "An especial point of interest in the phylogeny of man has been brought to light in our North American beds. There are some things in the structure of man and his nearest relatives, the chimpanzee, orang, etc., that lead us to suspect that they have not descended directly from true monkeys, but that they have come from some extinct tribe of lemurs."

In reply to an editorial in *Science* asserting that man is of those forms whose ancestry is unknown, Dr. Theodore Gill says: "I cannot but think that the data at hand are already abundant for an answer, and that we can allocate his systematic relationships as well as those of any other animal. It is difficult for me to understand how any one acquainted with the data could reach a conclusion other than that man is the derivative of a form very much like the chimpanzee and gorilla, and that could his remote ancestors be seen, they would be placed not only in the same family, but in the same group with the African apes."

The Cutting of Spectacle Lenses.

The work of cutting is all performed with a tiny fragment of diamond, known in the trade as a spark. It is not every spark, however, that will cut a lens. The sparks are mounted in the following manner: A piece of brass wire is selected, say $\frac{1}{16}$ of an inch in diameter, a hole is drilled in the end large enough to admit the spark, and it is set in the hole with the point up. The outer edge or shell of the wire is beaten inward and holds the spark firmly in place. The wire is then placed in the lathe and cut off just back of the spark, turning the end hemispherical, using the point of the spark that sticks through the brass as a center. A piece of steel wire is next selected, of the same diameter as the brass wire, and the end is turned in, forming a cup. The mounted spark is then soft-soldered into this cup and it is ready for the machine, which works automatically from a pattern, and can be set to cut larger or smaller than the pattern. Before the mounted spark is placed in the machine, however, it is tested by holding the handle upright. If it does not cut in an upright position, the point is unsoldered by means of the blowpipe and the handle resoldered, leaving the cutting point at the required angle, while the handle itself is upright. When the spark is found to cut well in an upright position, it is then placed in the machine for trial. The glass is placed upon a pad under the spark, the glass varying in form according to the kind of lens being cut. If the lens is flat, the pad is also, and if the lens is convex the pad is concave, and must be a perfect fit; for the better the fit, the more accurate will be the work. The pattern and glass travel around while the diamond remains stationary.

The life of a spark is short, some being only one day, while once in a while they can be worked for a year. The workmen average fifty dozen pair of lenses per day. A good diamond will cut on an average of 1,500 dozen pairs. The average lens measures four inches around, and a dozen pairs would be eight feet. In cutting 1,500 dozen pairs the spark would travel over a surface equal to a piece of glass 12,000 feet long. There are exceptional sparks that cut for months. I now have one which has been in operation for fifteen months and has cut 7,200 dozen pairs, traveling about 57,600 feet. We use two kinds of sparks, the Brazilian and the African, and they cost from $3 to $5 each.—*The American Jeweler.*

Roller Journal Bearings.

Some interesting figures as to the work of anti-friction roller journal bearings have been supplied during the past month. *The Master Mechanic* says:

The Tripp anti-friction journal bearing was given a dynamometer test on the New York & New England Railroad by J. B. Henney, superintendent of motive power, and other officers of the road. The test on cars numbered 150 and 156, having the master car builders' standard journals, showed a draughting strain of 600 and 800 lb. respectively, and on the 12-wheeled Pullman car Calypso a strain of 700 lb., averaging for the three cars 700 lb. Car 158, with Tripp bearings, commenced running January 28, 1889, and was guaranteed to run one year without any attention or additional lubrication, and has now run over 18,000 miles. This car was moved with a strain of 250 lb., showing a saving of power of over 60 per cent in favor of the Tripp bearings.

RECENTLY PATENTED INVENTIONS.

Mechanical.

REMOVING BROKEN SCREWS, ETC.—Maurice Cann, Weatherford, Texas. This invention covers an improved bit, provided with an internal spiral cutting thread and external cutters, and especially designed for extracting screws, taps, screw bolts, etc., from iron, marble, or other hard substances, in case one of the articles is broken off in the material.

MACHINE FOR BORING AND TRIMMING SLATS.—John Colville, Brunswick, Ga. This is a machine for boring, drilling, and cross cutting, capable of receiving a number of slats and automatically delivering them to a series of drills or bits and a series of saws, the object being further to provide a machine for treating slats in a crate patented by the same inventor.

SLAB SAWING MACHINE.—David S. Abbott, Olean, N. Y. This invention provides a "slab slasher" in which the material will be automatically fed to the saw for each successive cut, and a means whereby the slab will be automatically prevented from feeding lengthwise while the saw is in the cut, and for holding the slab stationary while being cut and releasing it to be fed forward for another cut.

Miscellaneous.

WASHING MACHINE.—Luke L. Kellogg, Leon, N. Y. This is a simple and strong machine, its parts being adapted to be readily secured for operation in an ordinary wash tub, and the machine is designed to perform its work with the minimum of friction and labor, and in a thorough manner.

DADO GUIDE.—Willie S. Comstock, Binghamton, N. Y. This is a guide adapted for use in connection with a dado plane, the invention providing a portable device of simple and durable construction, and conveniently handled, which may be readily applied to or detached from a piece of timber and guided to produce a straight or a diagonal cut.

FENCE BUILDING MACHINE.—John B. Kline, Sherman, Texas. Combined with a series of twisters and means of revolving them are fixed jaws and pivotally mounted jaws, with set screws constituting stops, and other novel features, for weaving a picket fence and insuring the proper binding of the pickets between the several strands of supporting wire.

WINDMILL.—Benjamin F. Ham, Cimarron, Kansas. This is a windmill in which a revoluble frame is mounted within the supporting frame, a horizontal crank shaft in the frame carrying a wind wheel, with a shutter case at one side of the revoluble frame, the mill being automatic in its operation in so far as the regulation of the amount of current delivered to the wheel is concerned.

WINDMILL.—Solomon Harbaugh, Geneva, Neb. This invention relates to that class of windmills in which the wheel is in the form of a vertical cylinder having vertical vanes and revolving about a vertical axis, the invention covering a novel construction and arrangement of parts designed to secure greater power and sensitiveness for the wheel and its better regulation.

CAR DOOR FASTENER.—Thomas G. Ruffhead, Renovo, Pa. This fastener is made with a screw-threaded bolt having a projection at its inner end, the faces of which are oblique to its length, in combination with a socket having inclined or tapered walls, being intended for use with doors which rest in the openings flush with the outer side of the car.

CLAY WASHING MACHINE.—Henery Woodcock, Perth Amboy, N. J. A vertical shaft is held to revolve in an open topped vessel having detachable auxiliary bottom with upwardly extending pins, arms being horzontally attached to the vertical shaft, and stirrer arms projected downward therefrom, the washer being adapted to receive clay directly from the bank, expeditiously cleanse it, and reduce it to the proper consistency for manufacturing various articles.

BRICK KILN.—Simon Dewhirst, Voris, Mo. This kiln has combustion chambers in its side walls, with channels leading to the interior of the kiln above the floor, chimneys between the chambers communicating with the interior near the bottom, in combination with a series of furnaces outside the kiln, to permit of sending the heat evenly through all the bricks at one time, thus greatly reducing the usual time of burning.

MINER'S CANDLESTICK.—Henry M. Mixter, Montana Ter. This is a candlestick designed to be supported by thrusting its point into the earth or a crevice in the rock, or by hooking it upon the wall of the mine, consisting of a pointed bar with a loop handle at one end, a spring socket to receive a candle, a nipper to compress the caps upon fuses, and a hook and claw for attaching it to the mine wall.

PIPE CLAMP.—William Walker and John B. Davis, Lackawanna, Pa. This clamp is made with two semi-cylindrical sections to be bolted together around the coupling, and having semi-annular flanges chamfered to form flaring openings, in connection with a packing calked within the clamp, for use upon pipes in which a high pressure is maintained, for strengthening parts that have become weak, and for mending ruptures and breaks.

SELF-SEALING BUNG.—Michael R. Maher, Zanesville, Ohio. This is a device for use with ice cream freezers, being an improvement on a former patented invention of the same inventor, in which a cap plate has an inwardly projecting thimble to enter the perforated wall of the ice-containing chamber, a hinged gate covering the thimble and sealing the aperture, the present invention rendering the sealing of the tap hole more secure when the freezer is exposed to handling and rough usage.

CABINET CLAMP.—Wendell P. Tarbell, Milford, N. H. This clamp has a head and clamping bar, with a joint bolt passing through the head and into the clamp bar, a dowel being inserted in the head and extending into the end of the clamp bar, by which pressure may be applied to the edge of the work without the necessity of placing the clamping screw exactly opposite the center of resistance.

WAXED PAPER.—Edward G. Sparks, Brooklyn, N. Y. This invention relates to the production of waxed or paraffin paper, and covers a novel mechanism for delivering the coating to the surface of the paper in a uniform manner and regulating its quantity, so as not to saturate the pores of the paper, but apply only a thin coating to its exterior surface.

LEMON JUICE EXTRACTOR.—John L. Easley, New York City. This device has a cone with an abrading surface, a frame for supporting the cone, and an operating holder mounted on the frame for holding and turning a half of a lemon on the cone to break the pulp and extract the juice, the lemon skin being readily lifted up after the juice has been extracted.

SPECTACLE CASE.—Charles R. Long, Louisville, Ky. In this case there is formed on one face an integral hollow enlargement forming a second compartment, with a cover, for holding a piece of soft chamois skin or other material for wiping the glasses.

CARRYING APPARATUS.—Nelson Weeks, Jr., Long Island City, N. Y. This invention relates to apparatus for conveying cash between the salesmen in a store and the cashier's desk, and consists in a track with carriage provided with carrier for the cash pockets, the carrier being movable on the carriage transversely of the track to successively present a different section of the carrier to the trips at different stations, the trips being all in line.

SCIENTIFIC AMERICAN BUILDING EDITION.

SEPTEMBER NUMBER.—(No. 47.)

TABLE OF CONTENTS.

The Scientific American Architects and Builders Edition is issued monthly. $2.50 a year. Single copies, 25 cents. Forty large quarto pages, equal to about two hundred ordinary book pages; forming, practically, a large and splendid MAGAZINE OF ARCHITECTURE, richly adorned with elegant plates in colors and with fine engravings, illustrating the most interesting examples of Modern Architectural Construction and allied subjects.

The Fullness, Richness, Cheapness, and Convenience of this work have won for it the LARGEST CIRCULATION of any Architectural publication in the world. Sold by all newsdealers.

MUNN & CO., PUBLISHERS,
361 Broadway, New York.

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Wire Rope Tramways for the economical transportation of ores and other materials. Quarry hoists. Wire rope of all kinds. The Trenton Iron Company, Trenton, N. J. New York office, Cooper, Hewitt & Co., 17 Burling Slip. Western agents, Fraser & Chalmers, Chicago, Ill.

For best hoisting engine. J. S. Mundy, Newark, N. J.

Wanted—Partner. Capital. Sawmill. P. J. Delamar, Oriental, N. C.

Wanted—Mechanical draughtsmen. Address, stating former experience, to E. G., box 773, New York City.

Wanted—Railway engineer of experience, first class testimonials and references, willing to go to the far East, for supervision of railway construction. One speaking German preferred. Write, stating salary expected, to W. W. W., box 773, New York.

Eureka Cotton Machine Belting.
A cheap and perfect substitute for leather or rubber belting. Address Eureka Fire Hose Co., 13 Barclay St., New York, for prices and samples.

Automaton Wanted—Any new and novel mechanical figure—either working drawing, rough model, or completed figure. If life-like in its movements, a liberal price will be paid. Address Key, 94 Liberty St., 3d floor.

Parties having a patent of merit for sale, or wanting an agency to sell patented articles, address, with particulars, Chas. Babson, Jr., 24 Congress St., Boston, Mass.

The Little Falls (N. Y.) Water Company in testing all the popular water motors have adopted those made by the Tuerk Hydraulic Power Company. Address No. 12 Cortlandt St., New York.

Guild & Garrison, Brooklyn, N. Y., manufacture steam pumps, vacuum pumps, vacuum apparatus, air pumps, acid blowers, filter press pumps, etc.

For the latest improved diamond prospecting drills, address the M. C. Bullock Mfg. Co., Chicago, Ill.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

The Holly Manufacturing Co., of Lockport, N. Y., will send their pamphlet, describing water works machinery, and containing reports of tests, on application.

Screw machines, milling machines, and drill presses. E. E. Garvin & Co., Laight and Canal Streets, New York.

Billings' Patent Adjustable Tap and Reamer Wrenches. Bronze Forgings. Billings & Spencer Co., Hartford, Conn.

Rubber Belting, all sizes, 77½ per cent from regular list. All kinds of Rubber Goods at low prices. John W. Buckley, 156 South Street, New York.

Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Friction Clutch Pulleys. The D. Frisbie Co., N. Y. city.

"How to Keep Boilers Clean." Send your address for free 96 p. book. Jas. C. Hotchkiss, 120 Liberty St., N. Y.

Woodworking machinery, planers, surfacers, matchers, beaders, etc. Rollstone Machine Co., Fitchburg, Mass.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

☞ Send for new and complete catalogue of Scientific and other Books for sale by Munn & Co., 361 Broadway, New York. Free on application.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(1297) L. B. H. writes: Will a coating of water glass on white paper form a surface similar to the white silicate slates of commerce? Or would a mixture of clear varnish, such as dammar, with pulverized pumice stone, answer the purpose? A. Use shellac dissolved in alcohol mixed with Chinese white and ground pumice. Water glass will not work. Dammar varnish would be slow in drying.

(1298) O. A. H. writes: 1. Find inclosed a bright gold-like substance which I found lately in a gravel bank. Some think it is gold. What is it? A. It is mica, of no value. 2. Is the salt water of the ocean used in the boilers of sea-going vessels? A. Yes. The boilers are occasionally blown off to prevent the water from exceeding a certain specific gravity.

(1299) S. F. L. asks: 1. How are rubber stamps made? A. See SUPPLEMENT, No. 83, for a paper on this subject. 2. How can I melt rubber so that it will run readily? A. No way of doing this is known. See SUPPLEMENT, Nos. 249, 251, 252, for full description of the India Rubber manufacturing processes. 3. How can I test a thermometer so as to know whether it is correct or not? A. Best by comparison with a standard thermometer. You may test the boiling point by exposing it to a vessel full of steam at atmospheric pressure, and the freezing point by immersion in ice water.

(1300) F. V. H.—Bamboo can be ornamented by burning with a blow-pipe or hot iron. It can be burnt through a stencil, so as to give the marking a definite form.

(1301) J. P. O'L. asks for a receipt for making sirup of tar. A. Take of pine tar 3 ounces avoirdupois; cold water 5 fluid ounces; boiling distilled water 20 fluid ounces; powdered sugar 28 ounces avoirdupois. Pour the cold water upon the tar and stir frequently during 24 hours; pour off and throw away the water. Pour the boiling distilled water upon the tar, thus washed, and stir briskly for fifteen minutes and set aside for 36 hours, stirring occasionally. Decant the solution and filter. Lastly in seventeen fluid ounces of the filtered solution dissolve the sugar by agitation without heat.

(1302) H. J. K. asks if the armature described for the eight-light dynamo would work in simple electric motor. A. Yes. 2. Should I have 12 spaces instead of 24 spaces? A. Twelve or more. The more the better. 3. How many cells of battery will it take, each having an electromotive force of 2 volts? A. 6 to 8. 4. Have there ever been any machines invented for crossing cables running for cable railway roads? A. Yes.

(1303) C. J. C. asks how to make the reverse of the blue print, that is, blue lines on white ground. A. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 584, for full particulars.

(1304) J. M. asks: 1. Can you inform me in your Notes and Queries column how fluid and solid extracts are made, such as are used for medicines, etc.? A. By treatment with appropriate solvents, water, alcohol, etc., followed by expression or filtration of the juice and evaporation to a pasty consistence. The latter operation may be conducted in vacuo. 2. How to tell the purest carbolic acid solution. A. Its color is a simple criterion. It should be perfectly transparent and colorless. On evaporation and cooling it should crystallize, should melt at 106° Fah., and boil at 359° Fah. An addition of 5 per cent H_2O liquefies it. One volume of the liquefied acid added to glycerine should give a clear solution, not rendered turbid by addition of 3 volumes of water. If shaken up with chloroform in a graduated cylinder, the upper layer which separates is the water which it contained. 3. Of what power (focal distance) should a microscope be for ordinary to closer investigation, also how to determine the power of same? A. Place a micrometer in the field, the microscope being nearly or quite horizontal, and focus the instrument so as to see it clearly. By a camera lucida the image can be reflected to the eye so as to be referred to a sheet of paper placed eight or ten inches away upon a table. By having a scale laid upon the paper, the degree of magnification can at once be seen. A simple slip of cover glass held at the proper angle can be used as a camera lucida. The power of the instrument should be chosen for its work. You will certainly need two powers, say objectives of ¼ inch and 1 inch focus to begin with.

(1305) C. Holmes writes: 1. Electricians say that sheet, summer, or heat lightning is probably due to the reflection of a distant storm. You have no doubt noticed that in such reflection fork lightning appears. Will you please inform me how this double effect is produced? A. The sheet lightning may be the reflection of the visible forked lightning or of a more distant discharge. 2. Why is it necessary that the secondary coil should be of such high resistance? A. It is necessary to have a great length of wire in as close proximity as possible to the primary and its core. This can be done only by using fine wire, which necessarily has a high resistance. This resistance is not necessary, but it is unavoidable. 3. Is it healthy to sleep in a room where electric batteries of any kind are placed? A. Many batteries, such as the gravity, the Leclanche, and the Fuller, are not deleterious. Only such as give off hydrogen and acid fumes are undesirable. 4. Is No. 18 wire heavy enough for the primary coil of that explained in SUPPLEMENT, No. 160? A. With a heavy battery No. 18 wire is liable to heat unduly. It will answer very well in connection with a current adapted to it. 5. How many ounces of silk-covered wire are sufficient for the secondary coil? A. It requires about 1 pound of wire for the secondary. 6. Is there any difference between shellac and shellac varnish? A. Shellac varnish is gum shellac dissolved in alcohol. 7. Will the former suffice for the insulation on both coils, primary and secondary? A. Shellac varnish is one of the best of insulators.

(1306) E. J. P. writes: 1. I frequently see such an expression as "A 125 horse power dynamo," does this mean a 125 horse power electric motor, or does it mean a dynamo capable of supplying 94,250 watts? A. It is a dynamo capable of supplying 125 electrical horse power, or the watts you specify. 2. Is it sufficient to speak of an electric current in amperes alone? Would it not be more definite to give the voltage, as 20 amperes at 110 volts? A. As the current and its electromotive force are inseparable, it is proper to specify both amperage and electromotive force. 3. Is there any object in having such a high resistance in telegraph relays? Would not the same number of convolutions of a heavier wire around the magnet core work on just as long a circuit? A. There is no particular object in having high resistance in a telegraph relay, but the same number of turns could not be secured with a larger wire within the same space. With the large wire the outer convolutions would be too far removed from the magnet core to produce any marked effect upon it.

(1307) G. D. W. asks: 1. What is the approximate internal resistance of a bichromate of potash cell of battery having 2 plates of zinc and 3 of carbon, each 3 by 3½ inches, kept about one-half inch apart from one another? A. It depends on the condition of the battery. Probably ½ ohm. 2. What is the electromotive force of such a cell? A. Nearly two volts. 3. With a given magnet (field for motor), which will give the more magnetism, a current from a battery of a low internal resistance and the magnet wound with very heavy wire, or a current from one of a high internal resistance with coils of finer wire, the former with a greater and the latter with a lesser amperage? A. The current may be adapted to either winding so as to produce the same magnetic effect in either case. It all depends on the electromotive force of the battery. Determine which magnet has the greater number of ampere turns; such a one has the greater power. In broad terms, resistance is always disadvantageous, and

is only submitted to as enabling other conditions, small size, etc., to be attained.

(1308) F. H. B. writes: 1. I have a balloon six feet in length and $3\frac{1}{2}$ feet in the widest part. It is cone shape for two-thirds of the way from mouth up. The other portions are the same shape as any ordinary balloon. About how many cubic feet of hydrogen will it take to inflate it? A. About 24 cubic feet. 2. Also, about how much acid and zinc? A. About $6\frac{1}{4}$ pounds oil of vitriol and $4\frac{1}{4}$ pounds zinc. 3. Will a balloon charged with hydrogen ascend much higher than if filled with coal gas? A. It will ascend no higher. 4. Is there anything that will prevent paper balloons from sticking after they are varnished with boiled linseed oil? A. You should keep them inflated while drying. If once well blown up they will collapse very slowly, and as they dry, their own stiffness will tend to prevent the sides touching. 5. What will keep a large tin can from rusting after being placed in a cellar? A. Paint it thoroughly or varnish, and heat over a stove until dry. Two or more coats may be applied with advantage. Japanning would be still better.

(1309) W. H. A. asks the process of printing and lithographing sheet metal signs for advertising purposes, etc. A. The details of the art of printing on tin or other sheet metal have not been published, and are kept to some extent as trade secrets by the operators in this line of work. In general the work is done by transfer processes by means of an elastic roller which takes the print from the type or lithographic stone and transfers it to the plate in a roller press. Sheets of prepared paper are also used to take the ink from type or engraved plate and transfer it to the tin plate by roller press.

(1310) F. J. M. asks: How are toy balloons made and colored, and of what materials? A. They are made of thin sheet India rubber, often colored with alkanet root extract, producing red ones. The India rubber is cut into disks and cemented by pressure and India rubber cement at the edges. The process is described in our SUPPLEMENT, No. 249.

(1311) F. S. B. asks: It is said that zinc burned in a stove will remove the soot from the chimney. Is there any other substance in the form of a powder that would be cheaper, and answer the same purpose? A. We know of no substance that has any value except some explosive. A little gunpowder exploded in a chimney will often loosen the accumulation, but its application is dangerous. To apply it place a tablespoonful on a cold brick placed within the chimney and touch with a hot poker, standing well back.

(1312) C. S. asks (1) for papers treating on mechanical engineering. A. In the SCIENTIFIC AMERICAN and SUPPLEMENT you will find much valuable information and many papers on the subject. 2. What would be the cost of a course in mechanical engineering in some good and reliable school? A. No figure can be given. Address the different colleges for their prices. 3. How to wash flannel shirts to prevent them from shrinking. A. Wash in cold or lukewarm water in which some soap has been dissolved. Rinse out in clean water, stretching well, and iron while quite wet. It is very difficult to entirely avoid shrinkage.

(1313) A. S.—The distance of the horizon is governed by the height of the eye above the earth or sea. On the sea, with the eye at a height of 5 feet, the distance would be 3 miles; at 60 feet in height, 10 miles.

(1314) J. H. S. asks: 1. What is catarrh? A. It is a disease of the mucous membrane diagnosed by febrile symptoms and increase of secretion. 2. Is there any known cure or preventive? A. Tonics are sometimes of value, but no cure in the full sense of the term is known. Climate has a very great effect upon its intensity. 3. What is the cause? A. The cause is probably in many cases constitutional, and may be based on climatic extremes of temperature, etc. 4. What kind of a record did the English railroad locomotive lately imported by the Pennsylvania Railroad Company make? A. Its record we understand was an excellent one. 5. Do English railroad locomotives compare favorably with American, and are not the latter superior for durability and speed? A. They compare favorably, but are not well adapted to our roads, on account of the sharp curves allowed in this country. The question of which is best has never been finally settled, and it is hard to find a dispassionate and qualified judge. In speed the English are certainly equal to the American engines. The quality of the roadbed has a great deal of influence on the speed attained by either.

(1315) G. W. & Co.—Pick handles are sold so cheap now, that manufacturers utilize all the wood possible by straightening curved pieces so as to pass through the automatic machines. This wood when exposed warps. They can be warped back by clamps, but will not stay so when in use.

(1316) W. P. B. asks the usual method for accurately determining the melting points of metals. A. Pyrometers of highly refractory materials, as graphite and platinum, are used for obtaining the temperature of fusion of metals or the heat of fires. An electric pyrometer was also used by Pouillet and Becquerel for obtaining the temperature of furnaces. See illustrated descriptions of pyrometers in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 33, 172, 198, 286.

(1317) R. G. asks the correct angle for lathe centers. A. For light work 55° to 60°, heavy work 70°. The practice varies considerably among builders of lathes.

(1318) E. K. asks: I would like to know how concrete walks are made. A. Make a thick mortar of Portland cement one part, clean sharp sand three parts. Level off the ground. Spread the mortar three inches thick. It is best laid upon a foundation of broken stone.

(1319) M. T. O. asks for a receipt for removing ink from paper without staining the paper. A. Use a mixture of equal parts tartaric or citric acid and oxalic acid. Dissolve in water, and apply just enough to destroy the ink with a fine brush, and dry with blotting paper before it evaporates. A second application of the solution, or of water, to be dried as above, is beneficial.

(1320) W. N. H. asks how plaster of Paris can be made to adhere to paper without cracking. A. Mix it with a thin solution of glue containing one-tenth its volume of glycerine. This may answer your purpose, but you will have trouble in producing a strong degree of adhesion.

(1321) H. G. asks whether, supposing a silk bag to be filled with hydrogen gas sufficiently to distend it to its full size under the ordinary pressure of the atmosphere, it would be possible by means of a force pump to force say half as much more gas into it without bursting the bag. A. The bag to effect this would be subjected to a pressure of $7\frac{1}{2}$ pounds (about) to the square inch. If of large size, it would not stand it. As is evident, it is all a question of size and strength of the material. The silk would have to be thoroughly varnished not to leak at such a pressure.

(1322) E. E. S. asks why the divining rod so called turns in a medium's hands when he is trying to locate a spring of water. A. It is done by moving the hand or fingers, and has no reference to the presence or absence of water.

(1323) M. S. K. asks the meaning of a degree as used in measuring the strength of aqua ammonia. How many pounds of anhydrous ammonia are contained in one hundred pounds of aqua ammonia 26°? A. The degree is an arbitrary scale for denoting the specific gravity. The lower the specific gravity, the stronger is the solution in the case of ammonia. Your reference is to the Baume scale, on which 26° correspond to a specific gravity of 0·901, containing between 28 and 29 per cent of ammonia at 57° Fah., or 28 to 29 pounds in one hundred pounds of solution.

(1324) G. H. I. asks how to polish buffalo or cattle horns. A. This has been answered in the queries column before. Several methods are recommended, all similar in general terms. We give three: 1. The first thing to be done is to scrape the exterior of the horns, so as to obtain a perfectly even surface. This may be done with a steel scraper, such as the edge of a knife held nearly upright, or with a piece of glass. This will remove the natural roughness, but the horn will still present a dull appearance, devoid of luster. To impart the desired polish, make a pad of cloth or flannel, and having mixed some finely powdered bath brick and oil, rub the surface well with it. This will give smoothness to the horn, and all that is now necessary is to make another mixture of rotten stone and oil, and apply with a flannel or cloth pad, rubbing for some time, as the longer the rubbing is continued, the better will be the polish. Finish with dry flour or a little whiting, applied with a piece of chamois leather or a piece of linen rag, fine, soft, and clean; and complete the gloss which this will produce by rubbing with the palm of the hand, on which a little whiting has been sprinkled. If the polisher has a lathe, the polishing may be effected by a wheel covered with cloth; and with twisted horns this would be far more effectual, as it would be easier to reach all the convolutions of the horn in turn with a narrow wheel with a rounded edge. 2. Having scraped the work perfectly smooth, rub it with very fine sandpaper or Dutch rushes, repeat the rubbing with a bit of felt dipped in finely powdered charcoal with water, and lastly with rotten stone or putty powder, and finish with a piece of soft wash leather damped with a little sweet oil; or else rub it with subnitrate of bismuth by the palm of the hand. The powdered charcoal and bismuth can be had of any chemist. 3. Smooth by scraping with a steel scraper or a piece of broken glass; polish with a wet sponge dipped in ground pumice stone; then with rotten stone and oil applied with a chamois skin; and finally with oil alone followed by dry leather. For all three methods give plenty of rubbing, as much depends on it.

(1325) A. B. asks: 1. What weight will a magnet whose poles are six inches long and an inch in diameter be capable of sustaining? A. This depends upon the current and the winding of the magnet. It should readily support two or three hundred pounds. 2. Also would you advise tinning magnet and fitting poles with spools? A. There is no advantage in tinning a magnet. You may wind your coils upon thin cardboard tubes which will fit over the magnet poles. 3. How long should a good bichromate solution last in a pint cell with zinc and carbon two by three inches, and what capacity ought two such cells to have? A. If the battery you refer to is a plunge battery, it will run at its full capacity probably for two or three hours. It will probably give an output of three to four watts. 4. What is the best way to make a mould to cast zinc plates? A. The moulds for zincs are usually made of cast iron, but sand moulds answer a very good purpose. It is best to heat the mould well before pouring in the metal.

(1326) F. E. asks for a solution or powder that would preserve skins of birds or animals, which could be sprinkled on them when stuffing. A. White arsenic in powder is often used for such purposes. It kills any germs, and prevents the development of insect life. Tannic acid or alum may be used for temporary purposes.

(1327) W. C. J. asks: Will you please inform me through your SCIENTIFIC AMERICAN, the correct, or as near correct as you know of, distance of the Isthmus of Panama at the narrowest and at the widest parts? A. At the narrowest part, between the gulf of San Blas and the mouth of the Bayam River, 30 miles; at the widest, through the peninsula of Azuero, 120 miles.

(1328) J. B. M. asks: 1. What is the best text book on chemistry for a beginner in that study? A. Fownes' Elementary Chemistry, \$3.25 in cloth, \$3.75 in sheep, is to be recommended. We can supply it by mail at price mentioned. 2. What newspaper (chemical) would be of most service to a learner? A. *The American Chemical Journal*, edited by Prof. Ira Remsen, is the leading American chemical periodical. In England, France, and Germany a number of most excellent ones are published.

(1329) J. C. B. asks: What is the composition of the carbons used for the arc light, and in what way are they made to be as firm as they are? A. A process of making them is described in the SCIENTIFIC AMERICAN, May 18, 1889, p. 307. In factories they are shaped by machinery, and various formulæ are used by different makers.

(1330) E. W. asks: What oils, mixed with sawdust, will produce spontaneous combustion? A. The drying oils, such as linseed oil, are the most dangerous.

(1331) H. McK. asks: 1. Why is it advisable to decamphorate and denitrate celluloid? The article in your recent edition causes the question. A. To prevent the possibility of chemical reactions and changes. 2. If a piece of sal soda is exposed to the air, it soon falls to a white powder. Is this powder bicarbonate of soda? A. No. The change is due to loss of water of crystallization, and the product is carbonate of soda more or less dried.

(1332) G. F. Y. asks: 1. Can I learn telegraphy without a teacher? A. You can learn a great deal, but practical experience in an office is requisite. You must write a good hand to be a really good operator. 2. What instrument and books will I want, and what will they cost? A. Learner's sets are sold by dealers in electrical apparatus for \$3.50 to \$5. We can supply you with Lockwood's Hand Book of the Electric Telegraph, price \$2.50. Also Modern Practice of Electric Telegraph, by Pope, \$1.50.

(1333) P. F. D. asks for a good paste blacking for boots and shoes, one without acid, if possible. A. Animal black, 5 oz.; treacle, 4 oz.; sweet oil, $\frac{3}{4}$ oz.; thoroughly mix. The above is intended as the basis for a liquid blacking. If properly combined, acids are harmless. The following is a simple example. Animal charcoal, 8 parts; treacle, 4 parts; hydrochloric acid, 1 part; sulphuric acid, 2 parts. Also see Workshop Receipts, 4th series, for other formulas.

(1334) H. C. asks: 1. Is there a scientific book, besides May's Ballooning, on the subject of ballooning or aerial navigation? A. We can supply you with Wise on Aeronautics, price \$4. This is an old book, but the only other one on the subject that is accessible. 2. Where can the uninflated rubber toy balloons be procured? A. Address dealers in scientific apparatus or India rubber goods, for which consult our advertising columns. 3. When making hydrogen gas by heating slaked lime and zinc, what should be the proportions of lime and zinc, and how long should the mixture be kept at red heat? A. Use 85 to 90 parts zinc to 100 parts of lime, provided the latter does not contain an excess of water. As it is very likely to be supersaturated with water, it is best to depart a little from theory and use about 125 parts of slaked lime for above. Theoretically, 75·67 parts of quicklime slaked with 24·93 parts of water would give the 100 parts of slaked lime for the first formula. All parts are given by weight. Keep up the heat until the gas ceases to come off. 4. How many pounds of zinc will be required to make 1,000 cubic feet of gas by the above mentioned process? A. 171 lb. avoirdupois. 5. Are zinc turnings and filings fine enough for the purpose? A. Yes; if high enough heat is used. It is better, however, to use very fine powder.

(1335) T. H. writes: I have been trying to use solution of nitrate of ammonia for the purpose of condensing steam passing through a small room, and can get no satisfactory result; in fact can get no more refrigeration than hydrant water. A. Solution of nitrate of ammonia has little more refrigerating power than water, not enough to be of any practical importance. When the crystals are put in water they absorb heat as they dissolve, thus cooling it. When solution is effected, the refrigeration ceases.

(1336) O. H. W. asks: To what extent or degree does mercury corrode or amalgamate with iron or steel, as compared with brass or silver? A. Mercury under ordinary circumstances has no effect upon iron or steel. It is only by special methods of some difficulty that it can be made to form an amalgam with iron.

(1337) H. D. asks: In placing a school bell (in a town), will it sound to the best advantage placed on top of the building or near the ground? A. We should recommend a moderate elevation, above the level of the roofs of the majority of the buildings. Elevation is necessary to be above interference from buildings, but it weakens the effect.

(1338) L. D. C. writes: I wish to make a bimetallic thermometer, that will be small and sensitive, in order to readily respond to variations of temperature, and will have power enough to actuate a system of levers for recording. Will you advise me in the matter, as to dimension, form, etc.? Would the straight form, or the spiral, such as in Breguet's (described in Ganot's Physics) be best? A. You can use a compound bar made of brass and iron supported at both ends and working a system of levers. See SCIENTIFIC AMERICAN, January 29, 1887, p. 71. The Breguet spiral is still more sensitive.

(1339) D. R. P. writes: I want to write a prayer book in stenography, and beg to ask you what kind of ink (red and black) I must use, inks that will dry quickly, and that will not blur, even when a wet finger would come in contact with the written sheets. I would like to use very bright red and jet black inks. A. For black use Japan ink, coming in cakes. If you rub it up with a solution of shellac in borax water, it will make it still more waterproof. For red use best liquid carmine (not aniline) ink; it is made from cochineal. Or you can buy a cake of carmine water color and rub it up as above for red.

TO INVENTORS.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

September 10, 1889,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Cuff holder, H. J. Dale.... 410,750
Culinary utensil, C. Birkery.... 410,832
Cultivator, H. D. Kipp.... 410,596
Cultivator, E. Poole.... 410,648
Cultivator and harrow, J. Stoate.... 410,615
Cultivator and planter, combined, J. D. Stobaugh 410,996
Cultivator and seeder, J. S. Rowell.... 410,768
Cultivator, hand garden, J. A. Shrock.... 410,774
Cultivator tooth, spring, J. S. Rowell.... 410,769
Curry comb, F. W. Hoefer.... 410,971
Cut-off, rainwater, H. W. Knight.... 410,597
Cutlery handles, manufacture of, H. C. Hart.... 410,834
Cutter. See Band cutter. Fruit or ice cutter. Moulding cutter.
Damper, stove, W. C. Metzner.... 410,646
Dating and cutting machine, combined, G. J. Hill 410,970
Dental jaw prop, R. H. Daintree.... 410,665
Dental plugger, F. Schmidt.... 410,985
Dentist's chair, C. Raube.... 410,674
Derrick, J. Thompson.... 410,997
Die press, N. C. Stiles.... 410,746
Digger. See Post hole digger.
Dish drier, A. J. Wilson.... 410,818
Distilling column, E. Bolton.... 410,634
Doubletree attachment, S. Martin.... 410,910
Draught regulator for hot water boilers, automatic, W. P. Powers.... 410,717
Dredging apparatus, hydraulic, J. M. Miller.... 410,801
Dredging machine, W. P. Humphreys.... 410,739
Dress form, J. B. Stone.... 410,862
Drier. See Dish drier.
Drill machine, A. Knupfer.... 410,692
Drilling machine, Luscomb & Corey.... 410,762
Drilling machine, C. W. McDaniel.... 410,803
Dye, making a violet, R. Geigy.... 410,733
Dyeing apparatus, A. A. Sprague.... 410,744
Dynamos, determining the shape of pole pieces for, J. G. Statter.... 410,656
Elastic webbing, E. Lamb.... 410,829
Electric cables, air tight covering for, D. Brooks, Jr.... 410,953
Electric light fixture, J. C. Hollings.... 410,689
Electric machine, magneto, A. S. Fitch..410,964 to 410,966
Electric machine or motor, dynamo, F. J. Patten. 410,987
Electric machine regulator, dynamo, J. M. Bradford.... 410,663
Electric machines, brush holder for dynamo, C. D. Jenney.... 410,670
Electric machines or motors, commutator brush for dynamo, R. Hoffmann.... 410,806
Electric meter, M. M. M. Slattery.... 410,860
Electric motors, operating, F. J. Patten.... 410,988
Electrolytic apparatus, diaphragm for, Kerner & Marx.... 410,976
Elevator. See Trousers elevator.
Engine. See Expansion engine. Steam engine.
Engines, base frame for, B. A. Stevens.... 410,811
Evaporating apparatus, A. Miller.... 410,715
Exerciser, hand, G. H. Bidwell.... 410,778
Expansion engine, F. M. Wheeler.... 410,722
Extractor. See Lemon juice extractor.
Fanning mill, T. M. Bales.... 410,869
Fare register, H. R. Coffey.... 410,578
Faucet, coin-controlled measuring, C. O. White.... 410,948
Fence, J. D. Miller.... 410,912
Fence, P. H. Robbins.... 410,926
Fence looms, register for slat, Gray & White.... 410,387
Fence machine, I. R. Essig.... 410,706
Fence machine, T. G. & M. R. Simpson.... 410,654
Fence machine, picket, E. Redmond.... 410,690
Fence picket crimping machine, M. M. Shellaberger.... 410,611
Fence wire twisting device, W. H. H. Yount.... 410,951
Ferrule, S. W. Evans, Jr.... 410,828
Filter, O. Pierce.... 410,767
Firearm, magazine, Richardson & Woodbury.... 410,649
Firearm, magazine, C. P. N. Weatherby.... 410,621
Fire engine grate bar, R. Rose.... 410,929
Fire extinguisher, T. R. Rosier.... 410,931
Fire kindling composition, A. Rimpan.... 410,925
Flour mill, N. Cornelius.... 410,878, 410,879
Flushing tank, A. Rosewater.... 410,930
Frame. See Stretching frame.
Freight, apparatus for loading or unloading, T. H. Ross.... 410,737
Fruit or ice cutter, H. T. King.... 410,900
Furnace. See Gas generating furnace. Pot furnace.
Furnaces, firepot for hot air, S. Darling.... 410,880
Game or puzzle, C. M. Crandall.... 410,956
Gas, apparatus for manufacturing, H. S. Battin.... 410,839
Gas generating furnace, cupola, M. A. Morse.... 410,846
Gas generator and burner, J. G. Street.... 410,944
Gate. See Railway gate.
Gate, R. M. & L. P. Lively.... 410,644
Generator. See Gas generator.
Glove, A. M. Young.... 410,939
Glue heater, S. H. Mosher.... 410,765
Governor, steam engine, R. Hoffmann.... 410,897
Grain adjuster, T. B. Kirkwood.... 410,979
Grain separator, H. O. Triplett.... 410,776
Grate bar, Hall & Barth.... 410,689
Gripper, wire guy, J. Gibson.... 410,687
Gun barrels, ornamenting, G. A. Sachs.... 410,678
Gun carriage, J. B. G. A. Canet.... 410,968
Hame attachment, D. J. Martin.... 410,909
Hame rings, machine for attaching eyebolts to, A. Samson.... 410,771
Hammock and seat support, J. J. Johnson.... 410,796
Handle. See Non-heat conducting handle.
Handle, H. L. Palmer.... 410,672
Handle for buckets or fruit baskets, O. S. Gandy.. 410,986
Harrow, disk, H. D. Blakemore.... 410,973
Hat moulding machine, J. Hedges.... 410,969
Hatchway, P. O. Wirth.... 410,980
Hatchway covers, etc., device for operating, J. E. Briggs.... 410,737
Hay rake, side delivery, M. Rew.... 410,606
Heater. See Glue heater.
Heating apparatus, A. N. Martin.... 410,844
Heating apparatus, E. W. Olin.... 410,736
Hedge, P. M. Mishler.... 410,914
Heel burnishing machine, Knouff & Pope.... 410,838
Heel burnishing machine, S. Ross, Jr.... 410,932
Heel nail, F. F. Raymond, 2d.... 410,675
Heel nailing machine, F. F. Raymond, 2d..410,676, 410,677
Heeling machine, H. C. Hart.... 410,832
Holder. See Clothes line holder. Copy holder. Cuff holder. Paper holder. Paper roll holder. Spool holder.
Hook. See Back band hook. Checkrein hook.
Horse detacher, H. J. Kennedy.... 410,798
Horseshoe, W. R. Carmont.... 410,781
Horseshoe, W. Ziedler.... 410,625
Horseshoe nails, manufacturing, H. A. Wills.... 410,624
Hub attaching device, Lyles & Ward.... 410,982
Ice cream freezer, Shepard & Adams.... 410,773
Ice cream freezers, self-sealing bung for, M. R. Maher.... 410,800
Indicator. See Cash indicator. Time indicator.
Insulator, W. M. Davis.... 410,687
Invalid chair, L. M. Hoffman.... 410,891
Iron. See Tuyere iron.
Jack. See Boot jack. Lifting jack.
Joint. See Rail joint. Universal joint.
Kettle, steam, J. Petterson.... 410,862
Kiln. See Brick kiln.
King bolt socket, W. S. Reeder.... 410,853
Knitted drawers, making blanks for, D. P. Mills.. 410,600
Knitted webs, narrowing, R. W. Scott.... 410,858
Knitting machine, R. W. Scott.... 410,859
Knitting machine, circular, J. Polleycutt.... 410,854
Lace curtains, device for stretching and drying, D. Eastman.... 410,790
Ladder, extension step, W. Soper.... 410,612
Lamps above streets, structure for supporting, J. S. Adams.... 410,626
Lantern, Stewart & Blankley.... 410,943
Lantern or illuminator, lawn, J. H. Sprague.... 410,613
Latch, J. Brown.... 410,728
Latch, gate, C. M. & J. H. Sanders.... 410,934
Lathes, center rest for, J. Klingensmith.... 410,901
Leaf turner, C. P. Brown.... 410,779
Lemon juice extractor, J. L. Easley.... 410,789
Lifting jack, M. A. Stewart.... 410,995
Lifting jack, J. T. Weatherly.... 410,702
Limestones, preparing and hardening, G. J. Randall.... 410,607
Lithographic press, G. Heinsius.... 410,708
Lock, M. Riedinger.... 410,610
Locomotive spring, G. Hinsius.... 410,708
Locomotive spring, Wendlick & Lynch.... 410,868
Loom, hand, J. Scherer.... 410,772
Loom let-off mechanism, C. Hirst.... 410,835
Loom shedding mechanism, G. F. Hutchins.... 410,734
Loom shedding mechanism, V. Royle.... 410,718
Loom shuttle box operating device, E. E. Orrell.. 410,820
Lubricator. See Axle lubricator.
Magnetic body wear, G. A. Scott.... 410,652
Magnetic from non-magnetic particles, separating, G. Conkling.... 410,876
Magnetic separator, G. Conkling.... 410,877
Mail box attachment, R. B. Lewis.... 410,905
Match machine, J. H. White.... 410,622
Match safe, E. P. Hasbrouck.... 410,588
Mattress, woven wire, W. S. Seymour.... 410,937
Meat and vegetable chopper, I. M. Berry.... 410,682
Merchandise box, G. E. Raymond.... 410,920
Metal forming tool, A. S. Patton.... 410,606
Metal rolls, making, C. M. Schwab.... 410,651
Meter. See Electric meter.
Mill. See Fanning mill. Flour mill. Pulverizing mill. Sawmill.
Mirror, J. N. Richardson.... 410,924
Moulding cutter, E. Benjamin.... 410,572
Moulding machine, C. L. Goehring.... 410,887
Mower attachment, lawn, D. Johnson.... 410,836
Musical instruments, making barrels of, Carpenter, 2d, & Brott.... 410,875
Musician's exercising device, E. S. Bonelli.... 410,748
Nail. See Heel nail.
Neckscarf fastener, E. J. Friedland.... 410,732
Non-heat conducting handle, H. L. Palmer.... 410,671
Numbering device, C. H. Davids.... 410,958
Numbering of checks, tickets, etc., apparatus for the consecutive, J. Phillips.... 410,673
Nut wrench, J. B. Meier.... 410,985
Oil can, A. B. Shaw.... 410,938
Oils, apparatus for burning hydrocarbon, E. F. Edgar.... 410,836
Oven, baking, J. H. Miller.... 410,913
Packing, piston rod, H. H. Philper.... 410,918
Pan. See Baking pan.
Paper bag machine, W. A. Lorenz.... 410,843
Paper bag machine, Lorenz & Claussen.... 410,841
Paper bag machine, Lorenz & Honiss.... 410,842
Paper barrels, manufacture of, A. Brab.... 410,726
Paper clip for writing tablets, W. K. Crofford.... 410,560
Paper coating machine, J. Prasch.... 410,921
Paper hanging machine, K. L. Jones.... 410,642
Paper holder, printer, and cutter, roll wrapping, G. L. Kennedy.... 410,594
Paper, manufacture of waxed, G. E. Sparks.... 410,810
Paper, printing holder for roll wrapping, G. L. Kennedy.... 410,595
Paper roll holder and printer, G. L. Kennedy.... 410,593
Pen cleaner, R. W. Pope.... 410,919
Perforating machine, paper, A. E. La Roe.... 410,643
Pipe clamp, Walker & Davis.... 410,816
Pipe forming machine, C. E. Ashworth.... 410,630
Pipes, anti-freezing device for water, C. Miller.... 410,683
Plane, bench, G. Karrmann.... 410,710
Plane, rasping, C. S. Snowden.... 410,809
Plant protector, Sherman & Crouch.... 410,653
Planter, corn, J. G. Harris.... 410,707
Planter, corn, J. C. Hart.... 410,890
Planter, cotton and corn, C. Letot.... 410,904
Planters, marking and dropping attachment for corn, B. O'Donnell.... 410,805
Plow, G. B. St. John.... 410,899
Plow, gang, A. B. & T. A. Voelkerding.... 410,946
Polishing wheel, A. Colburn.... 410,749
Post hole digger, J. C. Duclos.... 410,640
Pot furnace, M. V. Smith.... 410,742
Press. See Baling press. Die press. Lithographic press.
Printing machine, rotary, J. J. Clause.... 410,576
Protector. See Plant protector.
Pulley, belt, J. G. Moomy.... 410,763
Pulp moulding machine, F. E. Keyes.... 410,977
Pulverizing mill, E. C. Griffin.... 410,756 to 410,758
Pump piston, B. H. Wells.... 410,867
Pump, rotary, C. M. Young.... 410,747
Race course, automatic, F. N. Lang.... 410,961
Rack for papers, etc., S. J. Beighel.... 410,571
Radiator, steam and hot water, T. C. Joy.... 410,691
Rail joint, H. B. Potter.... 410,636
Railway cross tie, E. Samuel.... 410,933
Railway crossing signal, D. H. Irwin.... 410,690
Railway, elevated, L. J. Cody.... 410,577
Railway gate, F. M. Montelius.... 410,915
Railway rail chairs, making, E. Samuel.... 410,906
Railway switch, J. T. Rigney.... 410,992
Railway switch, automatic, B. S. Eastman.... 410,961
Railway tie, metal, B. W. Ellicott.... 410,684
Railway tracks, foot guard for, E. P. Edward.... 410,666
Railways, semaphore signal for, C. H. Koyl, 410,598, 410,599
Rake. See Hay rake.
Refrigerator, N. D. Mertz.... 410,711
Register. See Cash register. Fare register.
Registering apparatus, autographic, J. B. Thies.. 410,616
Registering mechanism, P. Ford.... 410,885
Regulator. See Electric machine regulator.
Rings or tires, manufacturing rolled, J. Munton 410,604
Roller and seed sower, combined, T. A. Butler.... 410,873
Roller stud, S. Arnold.... 410,569
Rolling apparatus, L. D. York.... 410,724
Rolling girder rails, machine for, F. Colley.... 410,821
Rolling side bearing rails, rolls for, F. Colley.... 410,986
Rotary bolt, J. F. Walsh.... 410,651
Sash cord guide, W. G. Shedd.... 410,741
Sash fastener, H. S. & H. E. Klein.... 410,827
Sawmill, gang, T. S. Wilkin.... 410,623
Saws, device for joining the teeth of band, J. E. Miles.... 410,647
Sawing machine, slab, D. S. Abbott.... 410,777
Scale, automatic grain, K. H. Schaper.... 410,857
Scale, spring, E. F. Bergman.... 410,962
Scraper and bell pull, combined shoe or boot, Bohm & Eichelberg.... 410,633
Screw, drive, C. D. Rogers.... 410,698
Screw, wood, C. D. Rogers.... 410,697
Screws, etc., device for removing broken, M. Cahn.... 410,780
Sea sounder, electric registering deep, Cooper & Wigzell.... 410,786
Seam finishing machine, P. A. & J. Coupal.... 410,636
Secondary battery, J. T. Van Gestel.... 410,680
Separator. See Grain separator. Magnetic separator.
Sewing looped fabrics, trimming attachment for machines for, A. L. Traver.... 410,720
Sewing machine cording attachment, E. J. Toof.. 410,618
Sewing machine, ruffler, E. J. Toof.... 410,619
Sheave, carrying, A. Mill.... 410,986
Sheet metal articles, machinery for polishing, F. W. Perry.... 410,851
Sheet metal vessel, D. V. Thrift.... 410,617
Shingle, metallic, J. Henning.... 410,894
Shirt, woolen, S. Marcus.... 410,984
Sifter and dumper, ash, Brown & Page.... 410,575
Signal. See Railway crossing signal.
Sleigh, S. C. Felt.... 410,584
Slicer, vegetable, J. Enoch.... 410,582
Snow and cleaning roadways, apparatus for removing, A. Hentschel.... 410,895
Soldering machine, Livingston & Wilcox.... 410,761
Spectacle case, C. R. Long.... 410,798
Spinning spindle, compound, J. Lees.... 410,982
Spinning spindle support, G. Jaquith.... 410,974
Spool holder, A. W. Sawyer.... 410,890
Spout for vessels, Maloney & Robertson.... 410,908
Spreading viscous substances, machine for, J. H. Day.... 410,822
Spring. See Locomotive spring. Vehicle spring.
Stake pocket, W. Evans.... 410,731
Stamp, self-inking time and dating, B. B. Hill.... 410,589
Stand. See Boiler stand.
Stay and fastener, combined dress, L. E. Buchanan.... 410,954
Stave dressing machine, C. Sommer.... 410,904
Steam engine, J. T. Warner.... 410,866
Steamer, E. Dimmick.... 410,752
Stereotype block, J. C. Merritt.... 410,714
Stereotype matrices, backing compound for, J. F. Frey.... 410,830
Stereotype plates, means for securing, D. Reid.... 410,928
Stirrup, E. G. Sollors.... 410,989
Stock marker, live, Casper & Jacobson.... 410,782
Stoker, mechanical, W. Leach.... 410,735
Stone, artificial, O. E. C. Guelick.... 410,688
Stone, producing artificial, G. M. Breinig.... 410,635
Stone sawing machine, J. C. Ferguson.... 410,585
Stool and bucket, combined milking, J. H. Stewart.... 410,658
Stopper. See Bottle stopper.
Stove, gas, J. Gibbons.... 410,792
Stove, oil, J. De Mooy, Jr.... 410,638
Stretching frame, G. F. Stengel.... 410,745
Suspenders, M. Rubin.... 410,855
Switch. See Railway switch.
Switches, mechanism for operating three-throw, H. M. Norton.... 410,916
Table leaf support, E. Helm.... 410,892
Tank. See Flushing tank.
Tap and drill, machine, C. Steiner.... 410,614
Telephone, acoustic, L. V. Elliott.... 410,791
Tent, W. Chadd.... 410,783
Terrett, J. T. Stoll.... 410,812
Thill coupling, A. J. Obrist.... 410,849
Tie. See Railway tie. Railway cross tie.
Time indicator, P. G. Giroud.... 410,967
Tongue support, wagon, R. Lynn, Sr.... 410,799
Toothpick, antiseptic, K. M. Hellwig.... 410,794
Toy figures, mechanism for operating dancing, acrobatic, and other, G. F. Lutticke.... 410,907
Trimming the edges of fabrics, machine for, R. T. Smith.... 410,655
Trousers elevator, S. W. Brock.... 410,704
Tubes, device for slotting, C. H. Wiesing.... 410,723
Tuyere iron, F. G. Koehler.... 410,903
Typewriting machine, D. Allen, Jr.... 410,627
Typewriting machine, G. K. Anderson.... 410,628
Typewriting machine, H. L. Arnold.... 410,629
Typewriting machine, G. C. Blickensderfer.... 410,662
Typewriting machine, W. G. Spiegel.... 410,941
Typewriting machines, aligner for, C. Spiro.... 410,743
Umbrella sticks, machine for slotting, Jesson & Weed.... 410,975
Universal joint, S. Arnold.... 410,570
Valve gear for engines, cut-off, I. F. Thompson.... 410,775
Valve gear for gas engines, E. Capitaine.... 410,729
Valve gear for steam engines, C. W. Hunt.... 410,700
Valve, piston, A. Loomis.... 410,906
Vaporizing and burning hydrocarbon oils, apparatus for, E. F. Edgar.... 410,837
Vaporizing hydrocarbon oil and burning the same, device for, A. Doney.... 410,639
Vehicle, spring, H. A. Moyer.... 410,847
Vehicle spring, E. H. Carpenter.... 410,705
Vehicle spring, G. Norwood.... 410,716
Vehicle wheel, S. C. Mead.... 410,645
Velocipede, G. H. Davis.... 410,751
Velocipede, J. L. Watkins.... 410,661
Wagon box fastener, A. J. Adamson.... 410,725
Wagon brake, W. W. Atteberry.... 410,681
Washing fluid, J. H. Stewart.... 410,657
Washing machine, J. Knoble.... 410,902
Washing machine, H. W. Kriete.... 410,980
Watch case, Taft & Morand.... 410,945
Watch cases, picture holder attachment for, G. Scheiker.... 410,808
Watch pendant winding and setting device, W. T. Graessle.... 410,831
Water closet bowls, coupling, T. McHugh.... 410,848
Waterer, stock, J. M. Dewey.... 410,882
Weighing and putting up package tea, etc., apparatus for, O. A. Gill.... 410,886
Wheel. See Polishing wheel. Vehicle wheel.
Whiffletree, L. W. Smith.... 410,861
Wind instrument, L. Schemback.... 410,740
Window cleaning chair, S. H. Crook.... 410,867
Wrench. See Nut wrench.
Zirconium nitrate, making, F. Thiele.... 410,965

DESIGNS.

Bag frames, ornamentation of chatelaine, L. B. Prahar.... 19,305, 19,306
Bracket, M. Merkles.... 19,308
Burial casket lid, L. Stein.... 19,310
Celery dish, J. Locke.... 19,313
Chimney cap, G. Poirier.... 19,304
Coffin, L. Stein.... 19,309
Fence twisting disk, wire, C. T. Hupp.... 19,303
Lamp burner, Atwood & Tobey.... 19,307
Piano having supplemental top, upright, G. W. Lyon.... 19,302
Radiator, T. H. Williams.... 19,311, 19,312
Spoon, fork, etc., J. H. Argyll.... 19,301

TRADE MARKS.

Beer, P. M. Ohmeis & Co.... 17,006
Blacking, liquid shoe, J. M. Hillan.... 16,998
Boiler cleansing material, S. W. Lord & Co.... 16,999
Brandy, cognac, Pector & Ducout, Jr.... 17,008
Cigarette paper, J. Bardou et Fils.... 16,992
Cigars, Oneida Cigar Co.... 17,007
Cigars, cigarettes, and tobacco, N. Schuhmehl.... 17,010
Cordage, Schlichter Jute Cordage Company.... 17,009
Cough sirup, L. J. McConnell.... 17,004
Floor and bath mats, McKesson & Robbins.... 17,005
Ginger ale, J. Morgan.... 17,003
Ice making machines, A. Conacher.... 16,994
Meats and meat food products, Armour & Co.... 16,990
Mineral waters, J. Morgan.... 17,002
Nervine and general restorative, V. H. Monroe.... 17,001
Perfumery and perfumed toilet preparations and extracts, F. C. Calvert & Co.... 16,993
Shoes, M. Elkin & Co.... 16,995
Stain for furniture, liquid, Fleury & Faust.... 16,996
Stoves, heating and cooking, Michigan Stove Company.... 17,000
Soap, toilet, Granite City Soap Company.... 16,997
Tobacco and plug tobacco for chewing, smoking, Arnold, Carlton & McCord.... 16,991
Toilet preparations, various, W. S. Thomson.... 17,014
Underclothing, garments, corsets, and embroideries, laces, and trimmings for the same, ladies' and children's, Stapley & Smith.... 17,011 to 17,013

A printed copy of the specification and drawing of any patent in the foregoing list will be furnished from this office for 25 cents. In ordering please state the name and number of the patent desired, and remit to Munn & Co., 361 Broadway, New York.

Canadian Patents may now be obtained by the inventors for any of the inventions named in the foregoing list, provided they are simple, at a cost of $40 each. If complicated the cost will be a little more. For full instructions address Munn & Co., 361 Broadway, New York. Other foreign patents may also be obtained.

Advertisements.

Inside Page, each insertion - - - 75 cents a line.
Back Page, each insertion - - - $1.00 a line.

The above are charges per agate line—about eight words per line. This notice shows the width of the line, and is set in agate type. Engravings may head advertisements at the same rate per agate line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Founded by Mathew Carey, 1785.

HENRY CAREY BAIRD & CO.
Industrial Publishers, Booksellers, and Importers,
810 Walnut St., Philadelphia, Pa., U. S. A.

☞ Our new and Revised Catalogue of Practical and Scientific Books, 84 pages, 8vo, and our other Catalogues and Circulars, the whole covering every branch of Science applied to the Arts, sent free and free of postage to any one in any part of the world who will furnish his address.

ARCHITECTURAL BOOKS.

Useful, Beautiful, and Cheap.

To any person about to erect a dwelling house or stable, either in the country or city, or any builder wishing to examine the latest and best plans for a church, school house, club house, or any other public building of high or low cost, should procure a complete set of the ARCHITECTS' AND BUILDERS' EDITION of the SCIENTIFIC AMERICAN.

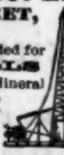
The information these volumes contain renders the work almost indispensable to the architect and builder, and to persons about to build for themselves they will find the work suggestive and most useful. They contain colored plates of the elevation, plan, and detail drawings of almost every class of building, with specification and approximate cost.

Seven bound volumes are now ready and may be obtained, by mail, direct from the publishers or from any newsdealer. Price, $2.00 a volume. Stitched in paper covers. Subscription price, per annum, $2.50. Address and remit to

MUNN & CO., Publishers,
361 Broadway, New York.

Best **DRIERS** for Grain, Sand, Salt, Wet Feed, Chemicals, etc. | S. E. Worrell, Hannibal, Mo.

OIL WELL SUPPLY CO. Ltd.

91 & 92 WATER STREET,
Pittsburgh, Pa.,
Manufacturers of everything needed for
ARTESIAN WELLS
for either Gas, Oil, Water, or Mineral Tests, Boilers, Engines, Pipe, Cordage, Drilling Tools, etc. Illustrated catalogue, price lists and discount sheets on request.

THE PROPELLING MACHINERY OF War Vessels.—A paper by H. J. Oram, Engineer R. N., of the Controller of the Navy's Department, etc. A description of the most important of the recent changes that have taken place in marine engineering, and a discussion of other matters of interest, in connection, principally, with the propelling machinery of modern war ships. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 692. Price 10 cents. To be had at this office and from all newsdealers.

ARTESIAN

Wells, Oil and Gas Wells, drilled by contract to any depth, from 50 to 3000 feet. We also manufacture and furnish everything required to drill and complete same. Portable Horse Power and Mounted Steam Drilling Machines for 100 to 600 ft. Send 6 cents for illustrated catalogue. **Pierce Artesian and Oil Well Supply Co.,** 80 Beaver Street, New York.

RABIES.—BY RUSH SHIPPEN HUIDEkoper, M.D. An historical account of hydrophobia, accompanied with a description of the symptoms of the disease and notes on the prophylactic treatment of it by the Pasteur method. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 693. Price 10 cents. To be had at this office and from all newsdealers.

COMPLETE STEAM PUMP ONLY SEVEN DOLLARS
DEMAND THIS PUMP OF YOUR DEALER OR WRITE TO US FOR PRICES.
VAN DUZEN'S PATENT
VAN DUZEN & TIFT.
SOLE MAKERS
CINCINNATI, O.

The Paris Exposition--Illustrated.

The SCIENTIFIC AMERICAN SUPPLEMENT will for some months to come contain illustrations of the buildings and the most interesting objects to be seen at the great French Exposition opened at Paris a few days ago. The illustrations which will embellish the SCIENTIFIC AMERICAN SUPPLEMENT will add an interesting and useful feature to the publication, and subscribers to the regular edition of the SCIENTIFIC AMERICAN, who are not patrons of the SCIENTIFIC AMERICAN SUPPLEMENT, are advised to have their name enrolled on the SUPPLEMENT subscription list at once, so as to secure all the illustrated exposition numbers for preservation. Price, $5 a year, $2.50 for six months. News agents everywhere receive subscriptions, or remit to the publishers,

MUNN & CO., 361 Broadway, New York.

Truss Hoop Driving.

BARREL, KEG,
Hogshead,
AND
STAVE MACHINERY.
Over 50 varieties manufactured by
E. & B. Holmes,
BUFFALO, N. Y.

PUMPING MACHINERY—ANCIENT and Modern.—A lecture by J. F. Holloway, delivered in the Sibley College course. An interesting and valuable review of the new and latest inventions relating to steam pumps. With 10 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 704 and 705. Price 10 cents each. To be had at this office and from all newsdealers.

PERFECT NEWSPAPER FILE

The Koch Patent File, for preserving newspapers, Magazines, and pamphlets, has been recently improved and price reduced. Subscribers to the SCIENTIFIC AMERICAN and SCIENTIFIC AMERICAN SUPPLEMENT can be supplied for the low price of $1.50 by mail, or $1.25 at the office of this paper. Heavy board sides; inscription "SCIENTIFIC AMERICAN" in gilt. Necessary for every one who wishes to preserve the paper. Address

MUNN & CO., Publishers SCIENTIFIC AMERICAN.

CURE for the DEAF by Peck's Pat. Improved Cushioned Ear Drums. Whispers heard distinctly. Comfortable, invisible. Illustrated book & proofs, FREE. Address or call on F. HISCOX, 853 Broadway, N. Y. Name this paper.

NEW YORK BELTING AND PACKING CO.

JOHN H. CHEEVER, Treas. **15 PARK ROW, New York.**

OLDEST and LARGEST Manufacturers in the United States of
VULCANIZED RUBBER FABRICS
For Mechanical Purposes.
RUBBER BELTING,
Packing, Hose,

Vulcanite Emery Wheels, Rubber Mats, Matting & Treads

SALESROOMS:—Philadelphia, 308 Chestnut St.; Boston, 52 Summer St.; Chicago, 151 Lake St.; Minneapolis, 28 South 2d St.; Cincinnati, 161-165 W. Pearl St.; Cleveland, 176 Superior St.; San Francisco, 14 & 16 Main St.; Detroit, 16-24 Woodward Avenue. European Branch, Pickhuben 5 Hamburg (Freihafengebiet), Germany.

SUBTERRANEAN WATER OF THE Oued Rir'.—Description of the Artesian Wells of the Saharan Oasis, with an account of the fishes and crustaceans found in the subterranean water. With 5 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 699. Price 10 cents. To be had at this office and from all newsdealers.

KEEP COOL!

CLARK'S
Light-Running Ventilating
FANS.
Adapted for Ventilating and Drying of every description.
Catalogue free.
GEO. P. CLARK,
Box L, Windsor Locks, Conn.
Jas. Goldsmith, Agent, 744 B'way, New York.

ELECTRO MOTOR, SIMPLE, HOW TO make. By G. M. Hopkins.—Description of a small electro motor devised and constructed with a view to assisting amateurs to make a motor which might be driven with advantage by a current derived from a battery, and which would have sufficient power to operate a foot lathe or any machine requiring not over one man power. With 11 figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 641. Price 10 cents. To be had at this office and from all newsdealers.

BRISTOL MF'G CO. STEEL BELT LACING WATERBURY, CONN.

BRISTOL'S PATENT
STEEL BELT LACING

Makes smooth elastic joint. Easily and quickly applied. Requires no special tools. *Box of 67 inches, assorted sizes, sent prepaid* for $1.00.
BRISTOL MFG. CO.
Waterbury, Conn.
Or 182 NASSAU ST., Room 56, New York City.

THE PENNA. DIAMOND DRILL & MFG. CO.
BIRDSBORO, PA., Builders of High Class Steam Engines, Diamond Drilling and General Machinery. Flour Mill Rolls Ground and Grooved.

DETECTIONS OF ADULTERATIONS in Volatile and Fixed Oils.—By S. P. Duffield, M.D. Description of an improvement in the Abbe refractometer, making the instrument of service in the detection of the optical quality of fluids, and especially of that of oils. With 4 figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 700. Price 10 cents. To be had at this office and from all newsdealers.

CASTINGS SOFT — STRONG ROUGH — FINISHED PULLEYS — GEARING
PATTERNS TO ORDER. ALLENTOWN FOUNDRY & MACHINE
3rd & WALNUT, ALLENTOWN, PA.

ELECTRICAL ENGINEERS
Send to American Watch Tool Co., Waltham, Mass., for circular of No. 3 Bench Lathe. A Screw Cutting Lathe 22 in. by 7 in. swing.

AUTOCOPYIST Duplicating Apparatus. Simplified Lithography. The Best Copying Process. Samples Free. Headquarters, Ten Eyck & Parker, 66 Pine Street, New York.

USEFUL BOOKS.

Manufacturers, Agriculturists, Chemists, Engineers, Mechanics, Builders, men of leisure, and professional men, of all classes, need good books in the line of their respective callings. Our post office department permits the transmission of books through the mails at very small cost. A comprehensive catalogue of useful books by different authors, on more than fifty different subjects, has recently been published for free circulation at the office of this paper. Subjects classified with names of author. Persons desiring a copy, have only to ask for it, and it will be mailed to them. Address,

MUNN & CO., 361 Broadway, New York.

AUTOMATIC REGISTER

Counts accurately the movements or productions of machinery. Saves labor and time. Send for circular. GEO. E. IVES, 379 State Street, New Haven, Conn.

THE EIFFEL TOWER.—AN EXCELlent engraving of the Eiffel one thousand-feet-high tower, which was opened to the public a few days ago, and which is to form a part of the French Exposition attractions, may be found, with description, in the SCIENTIFIC AMERICAN SUPPLEMENT, No. 554. To be had from newsdealers or at this office. Price 10 cents.

A NEW CATALOGUE OF VALUABLE PAPERS
Contained in SCIENTIFIC AMERICAN SUPPLEMENT, sent *free of charge* to any address.
MUNN & CO., 361 Broadway, New York.

ITALIAN CRUISER PIEMONTE.—BY P. Watts. Description of a new war ship of the protected cruiser class, with full details of the armament. With 6 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 700. Price 10 cents. To be had at this office and from all newsdealers.

VOLNEY W. MASON & CO.,
FRICTION PULLEYS CLUTCHES and ELEVATORS
PROVIDENCE, R. I.

LEPIDOCHROMY.—DESCRIPTION OF a process of fixing the colors of butterflies' wings upon paper, porcelain, and glass. With 4 figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 697. Price 10 cents. To be had at this office and from all newsdealers. The same number contains an article on the collection and preservation of butterflies, caterpillars, etc. With 2 illustrations.

Shepard's New $60 Screw-Cutting Foot Lathe

Gap Lathe, $125.

Foot and Power Lathes, Drill Presses, Scroll Saw Attachments, Chucks, Mandrels, Twist Drills, Dogs, Calipers, etc.
Lathes on trial. Lathes on payment.
Send for catalogue of Outfits for Amateurs or Artisans.
Address **H. L. SHEPARD, AGENT,**
134 East 2d Street, Cincinnati, Ohio.

MANCHESTER SHIP CANAL.—A paper by L. B. Wells, describing the plant and machinery of the great ship canal designed to give access to vessels of great burden to the docks at Manchester. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 685. Price 10 cents. To be had at this office and from all newsdealers.

Barnes' Patent Foot Power Machinery.

WORKERS OF WOOD OR METAL,
without steam power, by using outfits of these Machines, can bid lower, and save more money from their jobs, than by any other means for doing their work. Also for
Industrial Schools or Home Training.
With them boys can acquire practical journeymen's trades before they "go for themselves." Price-List Catalogue Free.
W. F. & JOHN BARNES CO.,
No. 1999 Ruby St., Rockford, Ill.

NITROGLYCERINE.—AN ELABORATE paper by Mr. Vuillaume, describing the method of manufacture of this explosive as practiced at the dynamite manufactory of Cengio, Italy. With 4 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 693. Price 10 cents. To be had at this office and from all newsdealers.

LOWDON BANK PUNCH
MANUF'D BY
The Heggson & Pettis Mfg. Co.
NEW HAVEN, CT.
Established 1849.
AGENTS WANTED to sell this Punch.

MODELS WANTED
One or two ready-made models of R.R. flat car. In length, from 2 to 4 feet, complete with brake rigging, inside brakes. Address P. O. Box 572, TRENTON, N. J.

THE DISCHARGE OF A LEYDEN JAR. By Prof. Oliver J. Lodge.—A popular presentation of some of the more interesting phenomena connected with the Leyden Jar discharge. With 1 figure. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 695. Price 10 cents. To be had at this office and from all newsdealers.

CARY & MOEN CO.
STEEL WIRE OF EVERY DESCRIPTION & STEEL SPRINGS. NEW YORK CITY.

2nd MACHINERY Lists Sent.
N. Y. Mach'y Depot, Bridge Store 16, Frankfort St., N.Y.

PLANT AND MATERIAL OF THE Panama Canal.—A paper by William P. Williams, Jr., descriptive of the machinery used in the engineering operations on the Isthmus. With 24 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 699, 700, 701, and 702. Price 10 cents each. To be had at this office and from all newsdealers.

2 to 40 H. P.

Economy, Reliability, Simplicity, Safety.

The MOTOR of 19th CENTURY.
Can be used *Any Place*, to do *Any Work*, and by *Any One*. No Boiler! No Fire! No Steam! No Ashes! No Gauges! No Engineer! A perfectly safe Motor for all places and purposes. *Cost of operation about one cent an hour to each indicated horse power.* For circulars, etc., address
Charter Gas Engine Co.
P. O. Box 148. **Sterling, Ill.**

PARAFFIN OIL, MANUFACTURE OF. By D. R. Steuart, F.I.C., F.C.S.—A sketch of the paraffin oil manufacture as carried on at Broxburn, giving a general notion of all the methods of working practiced there. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 696. Price 10 cents. To be had at this office and from all newsdealers.

MINERAL WOOL AS A LINING in WALLS and FLOORS for preventing escape of warmth and the deadening of same. Sample FREE. Western Mineral Wool Co., Cleveland, Ohio.

$10.00 to $50.00 per night. A light and profitable business. Magic Lanterns and Views of popular subjects. Catalogues on application. Part 1 Optical, 2 Mathematical, 3 Meteorological, 4 Magic Lanterns, etc. L. MANASSE, 88 Madison Street, Chicago, Ill.

TIGHT & SLACK BARREL MACHINERY A SPECIALTY
JOHN GREENWOOD & CO.
ROCHESTER N. Y.

COMPOSITION AND SELECTION OF a Subject.—A paper by T. T. Ellis, containing many valuable rules for the guidance of artists and photographers on the formation of good compositions. With 5 figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 700. Price 10 cents. To be had at this office and from all newsdealers.

AGENTS WANTED ON SALARY. $75 per month and expenses paid any active man or woman to sell our goods by sample and live at home. Salary paid promptly and expenses in advance. Full particulars and sample case FREE. We mean just what we say. Address Standard Silverware Co., Boston, Mass.

STEEL TYPE for TYPEWRITERS,
Stencils, Steel Stamps, Rubber and Metal Type Wheels.
New York Stencil Works, Mfrs.
100 Nassau Street, New York.

Proposals for Improved Designs of Postal Cards.—POST OFFICE DEPARTMENT, OFFICE OF POSTMASTER GENERAL, WASHINGTON, D. C., *Sept. 18, 1889.*—In order to secure, if possible, an improved design and border for postal cards, sealed proposals are invited from artists, designers, and others, and will be received at this Department until 12 o'clock noon on Wednesday, November 6, 1889, for such designs or drawings for the purpose, as bidders may wish to submit. Proposals should be made on the blank forms provided by the Department, securely enveloped and sealed, endorsed "Proposals for new designs for postal cards," and addressed to the Third Assistant Postmaster General, Washington, D. C. Blank forms of proposal, with specifications and information, will be furnished on application to the Third Assistant Postmaster General.
JOHN WANAMAKER, *Postmaster General.*

Proposals for Construction of Protection Wall at Navy Yard, League Island, Pa.—*September 10, 1889.*—Sealed proposals, endorsed "Proposals for Protection Wall, to be opened October 8, 1889," will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until 11 o'clock A.M., October 8, 1889, and publicly opened immediately thereafter, for the construction of 400 feet, more or less, of protection wall at the Navy Yard, League Island, Pa. Plans can be seen and blank forms of offer, with specifications, and all necessary information obtained upon application to the Commandant of the League Island Navy Yard. The Department reserves the right to reject any proposal not deemed advantageous to the Government, and to waive defects. Responsible security will be required for the faithful performance of the contract, and the bidder's bond will be twenty per cent. of the amount of their proposal for the work.
G. B. WHITE, *Chief of Bureau.*

SEND FOR NEW CATALOGUE. ALL WORK FIRST CLASS.
THE LUNKENHEIMER BRASS MFG. CO.
15 EAST EIGHTH ST. CINCINNATI.
RE-GRINDING GLOBE & CHECK VALVES
GATE VALVES, POP SAFETY VALVES
SIGHT FEED LUBRICATORS, OIL & GREASE CUPS
BRASS & PHOSPHOR BRONZE CASTINGS

WATER SOFTENING.—A PAPER BY Geo. E. Davis, on the proper treatment of water for use in steam boilers in order to prevent the formation of scale. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 704. Price 10 cents. To be had at this office and from all newsdealers.

PULLEYS. Cheapest, Lightest, and Best. Made by Hardwood Split P. Co., Menasha, Wis.

Boss Jute Weaver of 15 years' experience wants situation. References. Address John S. Henry, Ludlow, Mass.

FOREIGN PATENTS

THEIR COST REDUCED.

The expenses attending the procuring of patents in most foreign countries having been considerably reduced the obstacle of cost is no longer in the way of a large proportion of our inventors patenting their inventions abroad.

CANADA.—The cost of a patent in Canada is even less than the cost of a United States patent, and the former includes the Provinces of Ontario, Quebec, New Brunswick, Nova Scotia, British Columbia, and Manitoba.

The number of our patentees who avail themselves of the cheap and easy method now offered for obtaining patents in Canada is very large, and is steadily increasing.

ENGLAND.—The new English law, which went into force on Jan. 1st, 1885, enables parties to secure patents in Great Britain on very moderate terms. A British patent includes England, Scotland, Wales, Ireland and the Channel Islands. Great Britain is the acknowledged financial and commercial center of the world, and her goods are sent to every quarter of the globe. A good invention is likely to realize as much for the patentee in England as his United States patent produces for him at home, and the small cost now renders it possible for almost every patentee in this country to secure a patent in Great Britain, where his rights are as well protected as in the United States.

OTHER COUNTRIES.—Patents are also obtained on very reasonable terms in France, Belgium, Germany, Austria, Russia, Italy, Spain (the latter includes Cuba and all the other Spanish Colonies), Brazil, British India, Australia, and the other British Colonies.

An experience of FORTY years has enabled the publishers of THE SCIENTIFIC AMERICAN to establish competent and trustworthy agencies in all the principal foreign countries, and it has always been their aim to have the business of their clients promptly and properly done and their interests faithfully guarded.

A pamphlet containing a synopsis of the patent laws of all countries, including the cost for each, and other information useful to persons contemplating the procuring of patents abroad, may be had on application to this office.

MUNN & CO., Editors and Proprietors of THE SCIENTIFIC AMERICAN, cordially invite all persons desiring any information relative to patents, or the registry of trade-marks, in this country or abroad, to call at their offices, 361 Broadway. Examination of inventions, consultation, and advice free. Inquiries by mail promptly answered.

Address, MUNN & CO.,
Publishers and Patent Solicitors,
361 Broadway, New York.

BRANCH OFFICES: No. 622 and 624 F Street, Pacific Building, near 7th Street, Washington, D. C.

The Scientific American

PUBLICATIONS FOR 1889.

The prices of the different publications in the United States, Canada, and Mexico are as follows:

RATES BY MAIL.

The Scientific American (weekly), one year	$3.00
The Scientific American Supplement (weekly), one year	5.00
The Scientific American, Export Edition (monthly) one year	5.00
The Scientific American, Architects and Builders Edition (monthly), one year	2.50

COMBINED RATES.

The Scientific American and Supplement	$7.00
The Scientific American and Architects and Builders Edition	5.00
The Scientific American, Supplement, and Architects and Builders Edition	9.00

Proportionate Rates for Six Months.

This includes postage, which we pay. Remit by postal or express money order, or draft to order of

MUNN & CO., 361 Broadway, New York.

WORKING MODELS & LIGHT MACHINERY. INVENTIONS DEVELOPED. Send for Model Circular. Jones Bros. E. Co., Cin'ti, O.

THE

Scientific American

ESTABLISHED 1846.

The Most Popular Scientific Paper in the World.

Only $3.00 a Year, including Postage. Weekly. 52 Numbers a Year.

This widely circulated and splendidly illustrated paper is published weekly. Every number contains sixteen pages of useful information and a large number of original engravings of new inventions and discoveries, representing Engineering Works, Steam Machinery, New Inventions, Novelties in Mechanics, Manufactures, Chemistry, Electricity, Telegraphy, Photography, Architecture, Agriculture, Horticulture, Natural History, etc. Complete List of Patents each week.

Terms of Subscription.—One copy of the SCIENTIFIC AMERICAN will be sent for one year—52 numbers—postage prepaid, to any subscriber in the United States or Canada, on receipt of **three dollars** by the publishers; six months, $1.50; three months, $1.00.

Clubs.—Special rates for several names, and to Post Masters. Write for particulars.

The safest way to remit is by Postal Order, Draft, or Express Money Order. Money carefully placed inside of envelopes, securely sealed, and correctly addressed, seldom goes astray, but is at the sender's risk. Address all letters and make all orders, drafts, etc., payable to

MUNN & CO.,
361 Broadway, New York.

THE

Scientific American Supplement.

This is a separate and distinct publication from THE SCIENTIFIC AMERICAN, but is uniform therewith in size, every number containing sixteen large pages full of engravings, many of which are taken from foreign papers, and accompanied with translated descriptions. THE SCIENTIFIC AMERICAN SUPPLEMENT is published weekly, and includes a very wide range of contents. It presents the most recent papers by eminent writers in all the principal departments of Science and the Useful Arts, embracing Biology, Geology, Mineralogy, Natural History, Geography, Archeology, Astronomy, Chemistry, Electricity, Light, Heat, Mechanical Engineering, Steam and Railway Engineering, Mining, Ship Building, Marine Engineering, Photography, Technology, Manufacturing Industries, Sanitary Engineering, Agriculture, Horticulture, Domestic Economy, Biography, Medicine, etc. A vast amount of fresh and valuable information obtainable in no other publication.

The most important Engineering Works, Mechanisms, and Manufactures at home and abroad are illustrated and described in the SUPPLEMENT.

Price for the SUPPLEMENT for the United States and Canada, $5.00 a year, or one copy of the SCIENTIFIC AMERICAN and one copy of the SUPPLEMENT, both mailed for one year for $7.00. Single copies 10 cents. Address and remit by postal order, express money order, or check.

MUNN & Co., 361 Broadway, N. Y.,
Publishers SCIENTIFIC AMERICAN.

Building Edition.

THE SCIENTIFIC AMERICAN ARCHITECTS' AND BUILDERS' EDITION is issued monthly. $2.50 a year. Single copies, 25 cents. Forty large quarto pages, equal to about two hundred ordinary book pages; forming a large and splendid **Magazine of Architecture**, richly adorned with *elegant plates in colors*, and with other fine engravings; illustrating the most interesting examples of modern Architectural Construction and allied subjects.

A special feature is the presentation in each number of a variety of the latest and best plans for private residences, city and country, including those of very moderate cost as well as the more expensive. Drawings in perspective and in color are given, together with full Plans, Specifications, Sheets of Details, Estimates, etc.

The elegance and cheapness of this magnificent work have won for it the **Largest Circulation** of any Architectural publication in the world. Sold by all newsdealers. $2.50 a year. Remit to

MUNN & CO., Publishers,
361 Broadway, New York.

PRINTING INKS.

THE "Scientific American" is printed with CHAS. ENEU JOHNSON & CO.'S INK. Tenth and Lombard Sts., Phila., and 47 Rose St., opp. Duane St., N. Y.